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American Electroplaters' Society Holds Annual Convention

By G. H. LUX
General Railway Signal Company, Rochester, N. Y.

Nineteenth Annual Convention at Rochester, N. Y., a Huge Success from the Standpoint of Educational Sessions, Trips and Social Activities

THURSDAY July 2nd ended the Nineteenth Annual Convention of the American Electroplaters' Society held at the Hotel Seneca in Rochester, N. Y., from June 29th to July 2nd. Two hundred and fifty-eight men and eighty-three ladies registered at this convention and it was the unanimous opinion of all that the Convention was well worth attending. There was no rain to mar the outdoor activities but Rochester experienced one of its hottest weeks in history, as was borne out by the handkerchief-carrying crowds wherever the A. E. S. members assembled.

Papers

Twenty-three papers were presented at the educational sessions which took place Monday afternoon and evening, Tuesday morning, Wednesday morning and Thursday morning. The papers read were as follows:

(1) **"Looking Backward and Forward in the Electroplating Industry"** by Charles H. Proctor of the Roessler & Hasslacher Chemical Company, New York.

(2) **"Summary of Researches of Electroplating at the Bureau of Standards"** by Dr. W. Blum, Bureau of Standards, Washington, D. C.

PHILIP SIEVERING,
New President of the Electroplaters' Society.

(3) **"The Porosity of Chromium Deposits"** by W. P. Barrows and A. Brenner of the Bureau of Standards, Washington, D. C.

(4) **"Progress Report on Exposure Tests of Plated Coatings"** by P. C. Strausser, Research Associate, A. E. S.

(5) **"Further Developments on Low pH Nickel Plating"** by W. H. Phillips of the General Motors Corporation.

(6) **"Vapor Degreasing"** by Carrier Engineering Company of Philadelphia.

(7) **"Sciences and Practices in Electroplating"** by S. Fisher, Jr., of the Los Angeles Branch.

(8) **"From Mine to Consumer"** an illustrated moving picture by the American Brass Company, Waterbury, Conn.

(9) **"Tarnishing of Chromium Plating"** by W. H. Phillips of the General Motors Corporation.

(10) **"High Speed Nickel Plating as Practiced in England"** by Mr. Cannings.

(11) **"Barrel Plating with Zinc Cadmium Alloy"** by Dr. L. W. Stout of the Washington University (St. Louis Branch).

(12) **"Barrel Plating"** by Ray J. O'Connor (Bridgeport Branch).

(13) **"Buffing Compositions"** by L. R. Eastman of Frederic B. Stevens, Inc., Detroit, Mich.

(14) **"Black Oxidize Finishing"** by L. C. Hudgins and H. A. Cameron of the Taylor Instrument Companies, Rochester, N. Y.

(15) **"Chromium Deposits Directly on Aluminum"** by Dr. H. Work and Mr. Slunder of the Aluminum Company of America, Pittsburgh, Pa.

H. A. GILBERTSON of the Chicago Branch Was Re-elected Secretary-Treasurer of the Society This Year

(16) **"A Study of Silver Plating Solution"** by Dr. B. Egeberg and N. Promisel of the International Nickel Company, New York.

(17) **"A Resume of Silver Plating"** by Frank Mesle of the Oneida Community, Ltd., Oneida, N. Y.

(18) **"The Use of Colorimeter in Industry"** by Mr. Theo. J. Zak of the Bausch & Lomb Optical Company, Rochester, N. Y.

(19) **"Full Automatic Plating Machinery"** by A. H. Hannon of Frederic B. Stevens, Inc., Detroit, Mich. This paper was illustrated with lantern slides.

(20) **"Anodic Phenomena in Cadmium Plating Baths"** by G. Soderberg of the Udylite Process Company, Detroit, Mich.

(21) **"Chromium Plating in the Automotive Industry," "Deposition of Chromium upon Articles made from Sheet Zinc in the Automotive Products Industry"** by Charles H. Proctor of Roessler & Hasslacher Chemical Company, New York.

(22) **"Electroplating on Cold Rolled Steel"** by George B. Hogaboom of the Hanson Van Winkle Munning Company, Matawan, N. J.

(23) **"The Growth of the Use of Artificial Abrasives in the Preparation of Metal Surfaces Before Plating"** by Collins L. Hall of the General Abrasive Company, Niagara Falls, N. Y.

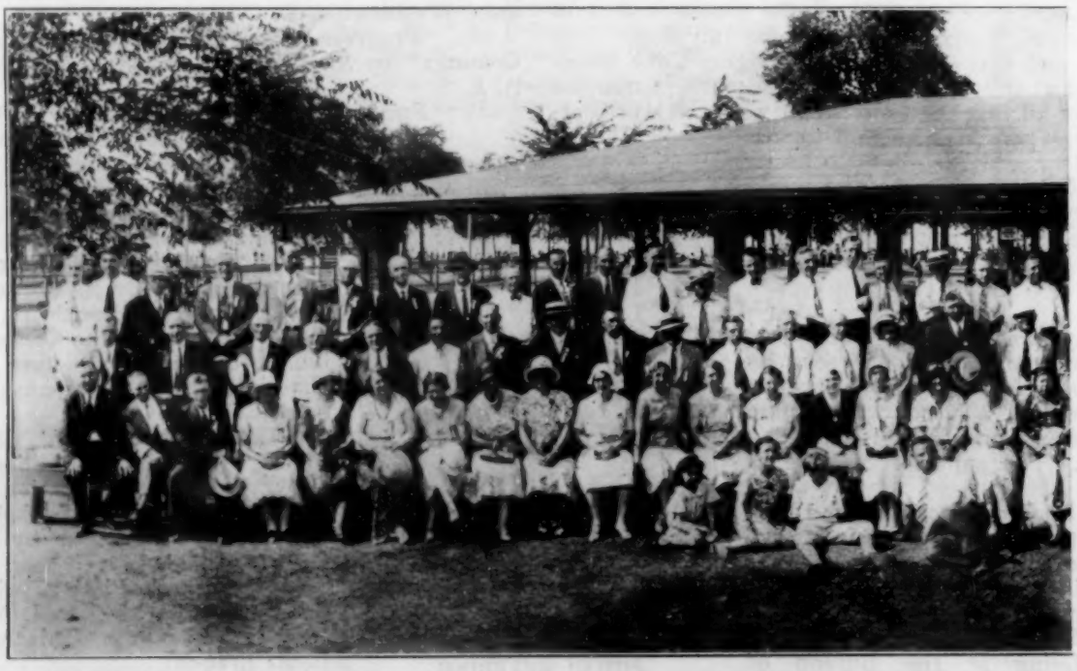
Plant Visits

There were four plant visits arranged, each trip taking members through two of Rochester's leading industries in which plating is an important part of their production operations.

Trip A was through the Kodak Park Works of the Eastman Kodak Company in which the members were shown the general operations in the production of film, plates and photographic paper and a special trip through this company's new research laboratory which is one of the finest and best equipped in the United States. The other plant on this trip was the Hickok Manufacturing Company where the visitors saw fine gold and other precious metal plating and the many forming operations in the manufacture of Hickok men's jewelry.

Trip B took the visitors through the Metal Arts Company and Bastian Brothers Company where the plating and finishing of novelty jewelry was being done.

Trip C included the Taylor Instrument Companies and the Ritter Dental Manufacturing Company. In these plants the A. E. S. delegates were shown how the plating was applied to the scientific instruments manufactured by the Taylor Instrument Companies



Members and Guests at the Annual Convention of the American Electroplaters' Society at Rochester. **(Photo Continued on Pages 287 and 288.)**

and the dental office equipment manufactured by the Ritter Dental Manufacturing Company.

Trip D was through the Stromberg Carlson Telephone Manufacturing Company and the Delco Appliance Corporation. In these plants a complete trip through the entire works was taken in which the visitors saw the operations and the manufacture of radio, telephone and electrical household appliances.

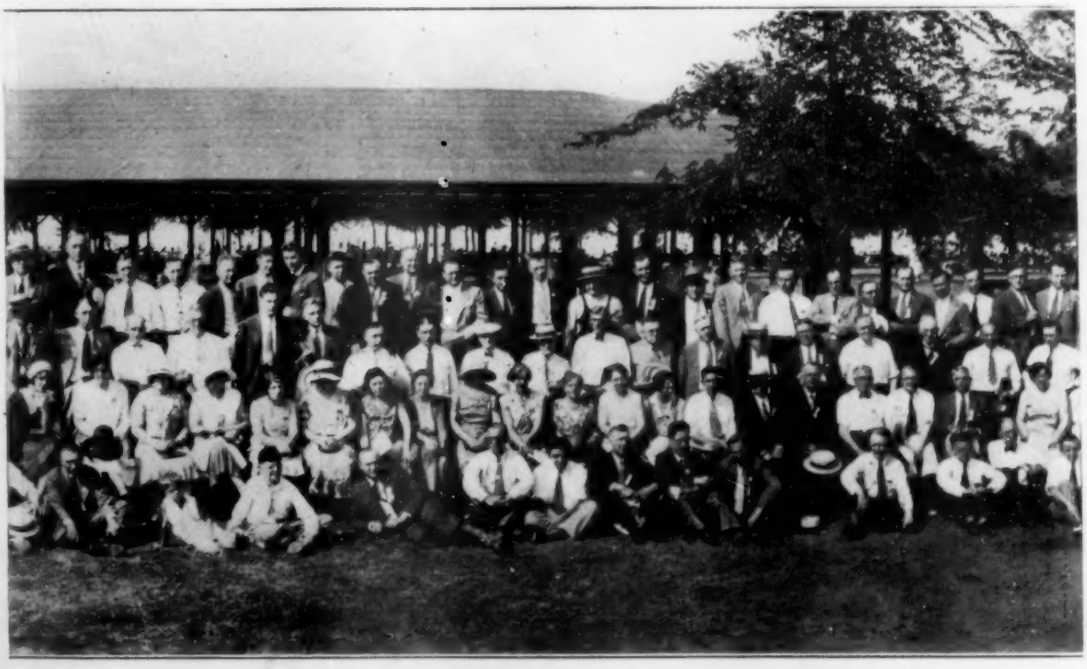
Exhibits and Prize Winners

There were a large number of exhibits of finished work by members of the A. E. S. Among these were: the exhibit of chromium plated plumbing hardware by the Speakman Company of Wilmington, Delaware; a large exhibit of cast iron articles of ornamental nature on which many novel finishes were applied by the Hubley Manufacturing Company of Lancaster, Pa.; an exhibit of chromium plated fishing reels manufactured by the Fox Company of Philadelphia, Pa.; an exhibit of bolts plated with cadmium zinc alloy by H. H. Williams of the St. Louis Branch, A. E. S. A large variety of self-tapping screws, cadmium and nickel plated by the Parker Kalon Company; **a beautiful exhibit of chromium plated headlights manufactured by the C. M. Hall Lamp Company which received third prize;** several pieces of door hardware finished in nickel and chromium and black and dull nickel; another exhibit of headlights finished in nickel, chromium and silver by the S. & M. Oval-Lite-ing Equipment Company.

The exhibit which won first prize was a Castle Full Automatic Sterilizer finished in chromium by the Wilmot Castle Company of Rochester, N. Y. Several exhibits were shown of the various types of finishes employed by the Bausch & Lomb Optical Company in finishing their products. These finishes included rhodium plate, yellow and rose gold, chromium plate and black oxide finishes on aluminum. An exhibit of tube skates was finished in copper and nickel by the Dunne Tube Skate Company of Toronto, Ontario, Canada. The E. C. Brown Company of Rochester, N. Y., had an exhibit of several chromium plated and lacquered velocipedes. The Eastman Kodak Company had an exhibit showing the various operations in the preparation of the front plate of their Brownie camera, outlining the effects of etching and the application of buffing lacquers and various plated finishes. Their exhibit was an outstanding feature of the convention. The advantages of buffing lacquer were quite apparent on their products as they enhanced the beauty of the colors considerably by bringing out an effect closely resembling cloisonné.

W. J. R. KENNEDY
Who Continues as Editor of the Monthly Review

Taylor Instrument Companies had an exhibit of some of the black oxidized finishes which were reported on in the educational sessions by L. C. Hudgins and H. A. Cameron. An exhibit of the gold, silver, enamel and other finishes was shown, as produced by the Hickok Manufacturing Company on the various articles of men's jewelry which they manufacture. **The second prize of the exhibit was awarded to the Robeson Rochester Company for their display of waffle sets, coffee percolators, cream and sugar sets, trays and toasters.** These articles were finished in gold, chromium and vitreous enamel with hand painted decorations. The base metals used in these



More of the Convention Party at Rochester. The Pictures on These Pages Show the Members and Guests Assembled at Ontario Beach Park. **(Photo Continued on Page 288.)**

articles were white metal, zinc base die castings and brass.

THE METAL INDUSTRY and the BRASS WORLD had available for free distribution to all visitors to the Exhibit Room, the Convention issues of both of these magazines and a new edition of the very popular Plater's Guidebook. The Kocour Company of Chicago had an exhibit of eleven different testing instruments which they have developed for the control of plating solutions. This company has simplified the control of plating baths to such an extent that it is no longer difficult for any plater to know the composition of his solution. Oakite Products, Inc., had a large and varied exhibit of products beautifully plated by manufacturers in the convention district which had been cleaned with Oakite cleaners prior to plating. The equipment supplied for the control and efficient use of Oakite cleaners was also on exhibit and their use explained by representatives in charge.

Social Activities

The International Fellowship Club is entitled to great credit for establishing the very good spirit of fellowship that prevailed through the whole convention as a result of their Get Together Party held the first night of the Convention at the Eagles' Hall. A card party was given for the ladies while the men attended the educational session and the winner at each table received a handsome prize. These prizes were donated by Sigmund Cohn of New York and consisted of rhodium plated novelties. Following the card party dancing was enjoyed by all until 2 A. M. on an excellent floor with a very fine orchestra. Between dances, refreshments peculiarly adapted to warm weather were available and were joyously accepted by every one. These intervals were also made very interesting by the awarding of many valuable door prizes donated by members of the International Fellowship Club. If the volume of the group singing that took place later in the evening could be considered as an indication of the success of this party there would be no hesitation to acclaim this party a huge success.

The picnic and annual ball game of the Platers and Peddlers headed by George Gehling and "Cyanide Bill" Schneider, respectively was held at Ontario Beach Park on Lake Ontario. The ball game was won by "Cyanide Bill's" team after a hotly contested match. Moving pictures were taken of this ball game and of the various activities of the 300 odd people who attended. A picnic lunch was served at 6 P. M. after which a chartered boat took the group to Sea Breeze, an amusement park, for the remainder of the evening.

The banquet was held Wednesday evening in the Ball Room of the Seneca Hotel. Dave Harvard was Master of Ceremonies and had a very fine group of entertainers during the dinner. After the dinner there was dancing until one o'clock. A special feature of the banquet entertainment was the showing of the movies taken eleven years ago at the Eighth Annual A. E. S. Convention held in Rochester; also the showing of the movies taken at the picnic on Tuesday, June 30th.

While the educational sessions were being conducted the ladies were entertained by a theater party, a shopping tour and a sight-seeing trip.

The Los Angeles Group presented the delegates with a different souvenir each day. Oranges, raisins, California poppies and orange marmalade were among the souvenirs. The Lea Manufacturing Company, Waterbury, Conn., presented all the ladies with a dainty vanity case. Lasalco, Inc., St. Louis, Mo., presented all those who attended the banquet with a chromium plated combination can opener. The METAL INDUSTRY and BRASS WORLD distributed free copies of the new edition of the Platers' Guidebook.

Next Convention City

The Twentieth Annual Convention in 1932 will be held in Philadelphia, Pa.

The Rest of the Party of Platers and Guests at the Picnic Held Annually During the Convention of the American Electroplaters' Society.

A. E. S. Officers Elected for Year 1931-1932

President—Philip Sievering, Newark Branch.
1st Vice Pres.—Charles Griffin, Rochester Branch.
2nd Vice Pres.—C. E. Marker, Detroit Branch.
Sec'y.-Treas.—H. A. Gilbertson, Chicago Branch.
Editor—William J. R. Kennedy, Hartford-Connecticut Valley Branch.

International Fellowship Club Officers

President—Robert Leather, Lea Manufacturing Company, Waterbury, Conn.
Vice President—N. P. Hunter, Egyptian Lacquer Company, Detroit, Mich.
Secretary & Treasurer—T. A. Trumbour, THE METAL INDUSTRY, New York.

Officers of the International Fellowship Club

ROBERT LEATHER
Chairman

N. P. HUNTER
Vice-Chairman

T. A. TRUMBOUR
Secretary-Treasurer

Prizes for Papers

Prizes for the best technical papers delivered during the convention of the American Electroplaters' Society had not yet been awarded as this issue went to press. The awards will be listed in the August issue.

The Fellowship Club held a raffle for a Kodak camera on the night of the banquet. The Kodak was won by "Cyanide Bill" Schneider. The proceeds were divided equally between the Rochester Branch and the Research Fund of the American Electroplaters' Society, each receiving $66.75.

Rolling Tin

Q.—We are sending you a sample of tin sheet which we have rolled. The sheet shows imperfections which resemble oxide. We have tried changing the metal mixture, but the spots still appear, not always in the same places. How can we produce sheets without blemishes?

A.—A careful examination of the tin sheet submitted shows three kinds of defects, as follows:

1. Depression, with small particles of foreign matter embedded, probably "scruff" from the casting operation on surface of the slab you used.

2. Small pits and clusters of finely divided matter, probably caused by dust, etc., which falls on the metal during the rolling operation and is rolled into its surface.

3. An undercoat of dark colored streaks, distributed well over the sheet, but not breaking the surface. This could be a microscopic film of oxide or "tarnish," carried out in the rolling. I do not know whether these streaks are a defect in relation to the purpose of the sheet.

Without a background of the process used in making the sheet, including your casting method, type of mold, pouring temperature, etc., it is difficult to suggest a remedy. There is no royal road to producing sheets of any material with a perfect surface. It means the most painstaking care in every step of the operation, and I can do no better than to outline the general practice.

Each slab from the casting shop is carefully inspected and all foreign matter, scruff, dross, mold scale is removed. This can be done with a round-nosed chisel and hammer, as these deposits are generally in spots.

After the sheet is broken down to approximately ¼ inch of finished gauge it is again inspected, and any foreign deposit that has appeared on the sheet is removed. This is done with a scraping tool, which must be so handled as to leave a fairly smooth surface.

All the equipment at the rolls must be clean and free from dust or larger particles of dirt, benches, roll guides, etc., and any equipment over the rolls that would harbor dust must be brushed clean, as the vibration of the roll shakes this down. A good practice is to have a canopy.

Tarnish stains are caused by handling the metal with bare hands. Gloves should be used.

Changing the mixture would not correct deposits of scruff or dirt in the casting operation. The greatest influence would be the temperature of the metal, type of mold, and speed of pouring. But even with the best practice it is almost impossible to produce castings absolutely free from surface defects that require removal by some mechanical means.

W. J. PETTIS.

Electroplating Aluminum

THE electroplating of aluminum is not a difficult problem when the simple covering of the metal only is to be considered. The difficulties that were experienced in the past have been overcome by the method that has been given to the electroplating industry through the work done by Dr. Harold K. Work, Research Fellow of the Mellon Institute, Pittsburgh, Pa.

Prior to his researches the best results were obtained by subjecting the work to the action of a sulfuric and nitric acid dip which contained an iron salt. By this method a fair deposit of nickel could be obtained, but when the work was used for outdoor exposure, the deposit would blister and flake off. For some classes of novelty work the finishes produced were really good, but the trade in general waited for a method that could be used regardless of what tests the plated work would be expected to withstand.

In the extensive study by Dr. Work a method was developed that has come into general use, but the majority of the platers do not yet realize that it is almost as easy to deposit nickel upon aluminum as it is to deposit nickel upon iron. The success of this method depends upon the proper etching of the surface of the aluminum so as to provide a sufficient anchorage for the nickel deposit.

As different alloys of aluminum are attacked differently by the various reagents, the most suitable etching solution must be determined for each alloy, and the plater must know the alloy he is working with for successful results.

The etching of commercial pure aluminum, or what is known as 2S metal, is satisfactorily accomplished in the nickel chloride, hydrochloric acid dip which is as follows:

Nickel chloride	36 ounces
Hydrochloric acid c. p.	25 ounces
Water	1 gallon
Temperature	85° to 90° F

Time of immersion is 15 to 30 seconds.

The temperature at which the dip is operated, the acidity of the dip, and the length of time the work is left in the dip are important factors to be considered. If the work is left in the dip too long, the etch will be too great and the finish will be pitted. If not left long enough in the dip, the surface will not receive the proper etch, and the deposit is not adherent. Experience will tell the proper length of time that the work should be left in the dip at a given temperature.

In cleansing the aluminum a weak alkaline cleansing solution is used, and the following one is recommended:

Sodium carbonate	2 ounces
Tri-sodium phosphate	2 "
Water	1 gallon

Use near boiling temperature.

Prepared cleaners suitable for such work, and guaranteed by the manufacturers, can be obtained from advertisers in THE METAL INDUSTRY.

The cleaning operation is followed by a cold water rinse. The work is then placed in an acid pickle made of hydrofluoric acid 1 ounce, water 1 gallon. It is then rinsed in cold water, placed in the nickel dip, cold water rinsed, and nickel plated in the following solution:

Single nickel salts	19 ounces
Magnesium sulphate	10 "
Ammonium chloride	2 "
Boric acid	2 "
Water	1 gallon

Temperature 90° F., pH 6, cathode current density 15 amperes per sq. ft.

After the aluminum has been nickel plated, it can be plated in any of the other plating solutions, and any of the different finishes produced.

For further information on the plating of aluminum write to the Aluminum Company of America, Pittsburgh, Pa., for a copy of booklet entitled Electroplating Aluminum.

OLIVER J. SIZELOVE.

Hot Tinning Copper

Q.—I am sending you a sample of my tin dipping of copper, and if you can enlighten me somewhat on this subject it will be appreciated very much. My operations are as follows:

I use a drawing compound for stamping or drawing, then thoroughly wash in an alkali cleaner solution; then pickle in a mixture of sulphuric and nitric acid which makes the work look bright, clean, and free of pits under the microscope; then rinse well in water; dip in flux; then in pure tin at 500° F. You will notice the pin holes show copper with sides of a black color.

Is it possible oxidation of copper takes place while dipping, which gets trapped, resulting in these dark colored pits?

A.—Your description of the process used in preparing your copper before dipping leaves nothing to criticize in that operation. The dipping of copper in a bath at 500° F. would not produce copper oxide, except a microscopic film, even if exposed to the air.

The foreign matter that forms the small pits is probably tin dross, collected on the tinned copper from the surface of the bath as the article is being removed. With no knowledge of your method of draining off the surplus tin, or whether the tinning operation is followed by the hot palm oil treatment, I would suggest running the bath up to 600° F. While this may make the tin darker in color, the more rapid draining of the surplus tin should carry away the tin dross before the tin sets.

W. J. PETTIS.

Removing Cadmium from Alloy

Q.—I want to prepare pure cadmium electrolytically from a metal containing approximately 92% cadmium, 7% zinc, and 1% lead. I would like to know what current densities, voltages, concentration of solutions, etc., to use. Would it be possible to deposit pure cadmium from such a material?

A.—It is impossible to electroplate pure cadmium from a metal containing the percentages of cadmium, zinc, and lead mentioned. In order to obtain pure metal, this alloy would have to be dissolved and purified.

A. K. GRAHAM.

The Cleaning of Metals Before and After Plating

By OTTO H. LOVEN

Consulting Electro-Chemist, Bridgeport, Conn.

The Treatment of Work for Proper Electrodeposition. This Article Covers Preliminary Handling, Cleaners, Rinsing, the Use of Water and the Care of the Solutions.—Part I.

THE word "Cleaning," in the everyday sense, is relative, and certainly very much abused. In stories of New England we often read of how the Housewife always presented a shining, clean house with well scrubbed floors, and bright copper. True, they were clean, in one sense, but not chemically clean. It is certain that any metal particles cleaned that way would never take an adherent coating of nickel, or, if seemingly adherent, a two-minute exposure to a chromium plating solution would surely show the nickel peeling off in great flakes. Recalling the most popular of the old methods of cleaning, the chalk and ammonia mixture, which was applied wet, let dry, and then rubbed off with a dry, woolen rag, it was evident even to the naked eye, not to speak of close examination under a magnifying glass, that a coating of finely divided chalk was still covering the metal.

The Need for Correct Cleaning

Any foreign substance, coating, or covering a metal surface, will prevent true adherence and intimate contact between the base metal and a subsequently applied metallic coating by electrodeposition. Therefore, it is of the utmost importance, that the plater secures a chemically clean surface on any article upon which he desires to deposit a metallic coating.

A pertinent illustration is given in the common occurrence today, where hundreds of articles, plated four and five years ago, are now brought in to be chromium plated, due to the higher lustre and better appearance given by chrome. While some of these are corroded so as to demand stripping, and complete refinish, there are also many others, which have been well taken care of, and present a good surface. When this business first appeared, the plater would naturally quote the customer a lower price on the latter objects, thinking that he would be able to plate chrome directly over the nickel. In a very few cases he succeeded, but in most cases he failed, due to nickel peeling. After a few such experiences, he naturally refused to take any more chances, and demanded to be allowed to strip the old plate before refinishing. Such a condition was, of course, discussed wherever platers met, and in a very short time, several of the larger supply houses, and some of the larger plating establishments had research engineers and chemists at work to solve the problem.

In a very short time the reason was found, and the verdict was unanimous:—Alkali. It was established in almost every case, that after the potash wash, and a rinse in water, a cyanide dip was employed to remove tarnish from the work, due to the hot potash wash. While a water rinse was always used after this cyanide dip, tests of this rinse water showed distinct contamination with cyanide, which of course was carried into the plating solution with the work. Even with a short shower rinse instead of immersion rinse no success was had. A rinse medium, which would effectively remove the cyanide, and itself be quickly removed by a water rinse, was called for. Various acids were tried, and the choice fell on hydrochloric acid, on account of its beneficial influence in activating the metal surface, and replenishing the chlorine content in the nickel solution, should any small amount of the acid be carried over with the work.

Preliminary Treatment

Cleaning methods vary with the metal to be cleaned, cast, drawn, or rolled. The final wash, before plating, is also dependent upon the kind of solution, in which the article is to be plated. Irrespective of the kind of metal employed, all sand castings require special treatment to remove incrusted sand. The most commonly employed methods and formulæ contain, besides other ingredients, a measured quantity of hydrofluoric acid, which is a solvent for silica. Drawn or rolled metals very often require a pickling operation to remove scale. In exceptional cases both of the above operations may be necessary to remove foreign matter on castings.

The one fault to be found with some of the common pickles is that they to some extent, attack the base metal after the scale is removed. On castings this is not so detrimental as on the smooth, drawn or rolled metal, where the surface thereby is considerably roughened, causing an added expense in polishing to restore the smoothness of the surface. To avoid this, certain chemicals are added, to prevent the pickle from attacking the metal. These chemicals, when used for such a purpose, are called inhibitors. Different pickles require different inhibitors. For brass, calcined soot has been used successfully; for iron and steel, common salt.

After either or both of the above operations a hot alkaline cleaner is used; sometimes in conjunction with anodic or cathodic current application. For work calling for a very high finish, polishing and buffing operations are done before cleaning in the alkali. The solution is generally made up from caustic soda and soda ash in varying strengths and often contains additions of trisodium phosphate and sodium cyanide, depending upon the task to be performed. It is possible, today, to purchase several kinds of prepared cleaners, which are very well suited to the purpose of cleaning one or another kind of metal, but many of the old-time platers prefer to mix cleaners of their own composition, having found

by experimenting, mixtures more suited for their particular problems. The question of which is the more economical of the two, to buy prepared cleaner, or to mix one's own, is rather hard to settle. If used in large quantities it may, perhaps, be cheaper to mix, but when bought in small lots, it is assuredly cheaper and easier to buy the ready mixed materials. It is significant that the very large users, in almost every case, buy the prepared cleaners.

Alkaline Cleaners

In this hot, alkaline cleaner the work is left for a period of 10 to 15 minutes, when no current is used, and for from 3 to 5 minutes when current is used. The application of current results in copious gasing, consisting of either oxygen or hydrogen depending on the direction of the current, gases acting mechanically on the metal with a scrubbing action, and also aiding in forming soluble salts and compounds. In cleaning buffed work, the gasing removes all traces of the buffing compound in corners and crevices, where brushing will not reach.

The composition of the buffing or polishing compound plays an important role in the cleaning operation, and it is perhaps well to call attention to the variation in make-up of these pastes or compounds, and their influence on the results obtained. The binder in all of the common prepared compounds is either animal or vegetable fat, or mineral grease. The first two saponify readily in the alkali, the third one does not. The relatively more expensive grades of buffing compounds are made up from the first two; the cheaper grades contain also a certain amount of mineral oil or grease, substituted for the others. Mineral oil, or grease, does not saponify, but enters instead another form, called emulsion. In contact with the alkali solution the mineral ingredient forms small, round globules, which are entirely surrounded by soap bubbles, created by the saponification of the animal or vegetable fats in the composition. The change in surface tension of the grease, occasioned by the formation of the emulsion, carries the grease to the surface of the cleaner, forming a solid layer. When the work is submerged in the solution, this emulsion coats over the entire surface of the work to be cleaned, dries from the heat, when the work is removed from the cleaner and exposed to the air. Consequently, instead of the work having been cleaned in the alkali bath, it has instead been coated with a hard grease film, making it worse instead of better from the standpoint of chemical cleanliness. The washes following the alkali do not contain any solvent, which will, to any extent, remove this, and the previous coating, and therefore the work goes into the plating solution in the condition it left the alkali, entirely unfit to receive the plate. Many cases of trouble due to peeling and blistering have been definitely traced back to just this fault. The saponification of the animal or vegetable fats, on the other hand, aid the work of the cleaner, to a certain extent, besides being very easily rinsed off.

Rinsing

The next operation consists of rinsing off the alkali. The universal medium is water. Personal observation of several plants has shown, that, curious as it may seem, cold water is nearly always used for this purpose. When this has been questioned, an attitude of surprise has always been evident, and the answer has invariably been: "Why, is that not the correct method?"

To say the least, a decided "No" is the answer. Let anybody, who doubts, dip his hands in an alkali solution, and then try to rinse it off in cold water, by dipping up and down. Repeat the same test with the water as hot as possible. Note the extreme difference in time consumed. The same applies to metal, and the result of rinsing in cold water is invariably to get a hard, chilled alkali film over the metal surface. Furthermore, the alkali, which penetrated into the pores of the metal, when it was expanded due to the heat of the solution, is then locked in there, due to the contraction in the cold water, and will resist any attempt, short of boiling out in a slightly acid solution, to remove it.

The correct method of rinsing off the hot alkali solution is to suspend the article in boiling, hot water, constantly renewed from a steam overflow pipe, so as to remove oily and greasy matter which floats up on top, through a discharge opening at the top edge of the tank. Do not rush through this hot rinse, but leave it in for at least 5 minutes. The result is a product which has been thoroughly cleaned from oils, greases, and other foreign matter, but not yet in condition to be plated on. Due to the action of the heat, and the submersion in the alkali there is a slight film of metal oxide evident on the surface, which the plater terms "tarnish."

The removal of the film, while a comparatively simple matter, is important, as otherwise an adherent plated coating can not be had. For copper, brass, and other metals and alloys of similar character, a 5 per cent cyanide solution serves best, while for iron a 10 per cent hydrochloric acid solution (1 part of commercial 35 per cent acid, 2½ parts of water) gives best results. Most plants have both, permanently installed, with a splash board inserted between, to prevent contamination, and resultant neutralization.

Following the deoxidation dip, a thorough rinse in running cold water is used. (Note: Unless a spray wash is employed, where the work does not come in contact with the used water, a separate rinse tank after either the alkali and acid tank must be used).

If the work is of non-ferrous metal, and is to be plated in a cyanide solution, it is now in shape to go into the plating solution after the cyanide rinse; also, if the metal is ferrous, and intended to be plated in an acid solution, no further rinsing is necessary. It is contrary to good practice, however, to reverse the above procedure, as traces of cyanide on the work, going into an acid solution will form a film of metallic carbonate; likewise traces of acid on work, being plated in a cyanide solution, will cause similar trouble. In such cases the work must be given an additional dip (after rinsing off the deoxidizing dip) in the other dip, then washed off again, before it is in the correct form for plating.

This article will be continued in an early issue.—Ed.

Brass for Thermostat Springs

Q.—What is the best brass analysis to use in making a good sensitive thermostat spring?

Which temper is considered the best to use in the above springs, soft, medium or hard?

A.—Spring brass, to function as a spring only, is made from a 65 copper 35 zinc alloy. The tempering is the result of the finish rolling operation.

The sensitivity of the spring must be determined by the size of the spring used (gauge and width) as a fixed temper is necessary if the spring is to retain its resiliency.

The research department of some of the brass producers will gladly furnish data covering any special requirements in this line. Some companies specialize in manufacturing brass to meet any demand.

W. J. Pettis.

Synthetic Resins

By RAY C. MARTIN
Technical Director, Lacquer Division, General Paint Corporation, Los Angeles, California

A General Discussion of Lacquers, Their Constituents and Properties. The Advantages of Synthetic Resins as the Base.

THE lineage of lacquer can be traced to ancient China where history informs us that a coating material was used in painting their sedans. In fact the oldest clear or transparent coatings known to history were so-called lacquers. This type of material, investigation has proved, is likened to present-day lacquer products only with respect to its rapid drying features. The name Lacquer, in this respect was probably derived through the use of a gummy secretion of a minute insect which fed quite freely on a native tree commonly called the "Lac-Tree." This larva, feeding on the bark and sap of the tree, formed a hard mass through the deposit exuded which is today commonly termed "Shellac." It is assumed that this gum was the basis for the quick drying material used, and because of its origin was termed "Lacquer."

Lacquering reached its highest development in Japan during the latter part of the middle ages. Specimens coated with this type of lacquer, known to be hundreds of years old, appear to be in perfect condition today. These products are relatively of different structure from the lacquer products as we know them today. In fact the Japanese lacquer closer approximates a varnish in that it is made from vegetable oils and gums. Varnish type of coating materials had been entirely used where protective and decorating applications were concerned until the discovery of nitrated cotton or nitrocellulose. This basis product presented possibilities of a quicker drying feature to a coating material. Products founded on this structure have been used in the metal coating industry since the late nineteenth century. With nitrocellulose as the basis for film formation, these lacquers have consisted of solvent, nonsolvent, resins and plasticisers and were well adapted to their use. Until that period in the present century (about 1920) at which time considerable investigation was devoted to this finish for use as coating medium for motor car use, the lacquer industry and available constituents remained practically unchanged. With the approval and widespread usage of lacquer products by the motor car industry, developments in the lacquer field have been very rapid, almost phenomenal. The lacquer chemists, working hand-in-hand with the suppliers of constituents of their product, have brought about the many developments, and the present-day lacquer product is a great improvement over the older type of typical lacquer materials.

It has been in the past few years, that greater attention has been given to the "synthetic" type of resinous compounds. Although these synthetic resins are not entirely new to varnish products, their use in connection with basic nitrocellulose has been welcomed. The varnish manufacturers, to combat the widespread use of lacquer products because of their rapid drying features, re-exploited on a larger and more determined scale, these synthetic enamels and varnishes. This development, together with close cooperation with the lacquer industry, has resulted in the commercial availability of "synthetic resinous compounds." These synthetic resins of the phenol formaldehyde and phthalic anhydride types, adaptable to introduction into and with nitrocellulose lacquers, have filled a long felt need to the lacquer industry. The older types of lacquer products had always presented a problem, in that the destructive ultra violet rays of sunlight hastened the deterioration of a clear lacquer film and did not produce the "body" deposit on the work. The available series of natural resins, Damar, Ester, Kauri, etc., when introduced into and with nitrocellulose materials with the object of body, adhesion and lustre, could only be exploited to a limited degree. These gum introductions as cold cuts increased the film adhesion and helped primarily in the lustre. As the gum was increased the relative deposit or "fullness" of the work was likewise increased. However, with the increase in resin content on this basis, the more brittle became the resultant film. Research on the part of the lacquer chemist has clearly demonstrated that film failures could be clearly classified and recognized and their ultimate causes clearly defined. The behavior of lacquer films indicated the desirable qualities to be incorporated and suggested the lines of work to be followed in order to overcome the existing deficiencies. The result as brought out, indicated that clear nitrocellulose films exposed outdoors to the sunlight suggested the development of a filter for these destructive ultra violet rays of sunlight. Therefore, a desirable quality to incorporate into a lacquer film would be more of the plastic nature of varnish film, which in addition to increasing the plasticity and building properties without too great a sacrifice in drying time, would resist the action of disintegration by the filtration of destructive rays of sunlight.

The synthetic type of resinous compounds is compatible with the ingredients used in the formation of a lacquer film. These resins may be used in proportionate amounts without endangering the life of the film thus formed, and maintain among other qualities that of fast drying, good adhesion, good building properties, good elasticity and ease of sanding. This type of material performs the combined function of plasticiser and resin combined. The synthetic resins are extremely tough and rubber-like in appearance and are oftentimes shipped as 50 per cent or 60 per cent solution to permit ease of handling. These solvent solutions are usually Toluole or Xylole which are permissible and compatible with nitrocellulose products. Recommendation of proportions to use vary in considera-

tion of the use of the finished product. Recommendations for use sometimes include as much as 150 per cent of the nitrocellulose used (dry basis) to products based entirely on synthetic resin. It is necessary that the introduction of a film-forming medium as represented by these synthetic resins insure proper compatibility with the balance of solid matter introduced to form the necessary film. The function of these solid matters in coordination with the volatile matter present is to permit a uniform spread of material over a given coated surface. To produce a flow of even structure (leveling) it is quite necessary to select solvents that perform the function of leaving the film surface at the proper time. The proper dispersement of solid matter is another character quite important.

Hardening Die-Casting Dies

Q.—After hardening a chrome vanadium steel die for die-casting we find that the hardening is probably deficient as the die shows checking marks after a comparatively short number of runs. We feel that the material of which the die is made is not at fault.

Can we reharden this die by the same procedure as normally followed, or is there some difference between hardening a die and rehardening it?

A.—If the die in question has shown excessive checking at an early stage, rehardening will not be of any benefit, since these cracks have worked below the surface and will still be present. The die could be annealed and reworked, removing approximately 1/16 to ⅛ inch of stock, and then rehardened. This would in most cases be almost as costly as replacing the die with one properly hardened. Once these checks form, they will continue to carry along still further, and they cannot be eliminated or checked by a second hardening. They must be completely removed.

A hardened die can be directly rehardened by following the original procedure, provided it is reheated very slowly, allowing casting and annealing strains to equalize.

If the steel used in the defective die was bought from a company which especially supplies die-casting steel, the trouble is no doubt due to improper hardening. The life of a die is dependent upon many factors, such as treatment, water-cooling, shape, flow of metal, gating, etc.

R. L. J.

Thickness of Electroplating

Q.—What is the thickness of nickel plating where the deposit amounts to 10 milligrams per square inch? Also, if a copper base is used amounting to 40 milligrams per square inch, what is the thickness of the copper?

A.—The weight of a cubic inch of nickel is .3182 pounds, and the weight of a cubic inch of copper is .3223 pounds. The weight of nickel deposited on a square inch is equal to the thickness of the deposit in inches multiplied by .3182. The weight of copper deposited on a square inch is equal to the thickness of the deposit in inches multiplied by .3223. As the weight given in the question is in the metric system it is necessary to divide the weight in pounds by 2.205 in order to reduce this weight to the metric measure. Furthermore, it is necessary to multiply the kilograms found by dividing by 2.205, by 1,000,000, in order to change to milligrams.

The thickness of the nickel deposit is calculated as follows:

$$\frac{10 \times 2.205}{.3182 \times 1{,}000{,}000} = .0000689 \text{ inches.}$$

The thickness of the copper deposit is:

$$\frac{40 \times 2.205}{.3223 \times 1{,}000{,}000} = .000274 \text{ inches.}$$

B. WEBSTER.

Hot Zincing (Galvanizing) Cast Iron

By WALLACE G. IMHOFF

THE following method of hot galvanizing cast iron was written in answer to the question of a subscriber:

Cast iron or malleable iron castings and fittings may possibly be coated with oil or grease. If they are, they should first be given a dip in a good commercial cleaning bath. After coming from the hot cleaning bath, and when they are dry, they should be tumbled in a tumbling barrel if small castings, or treated with a sand blast if larger castings. This treatment is to remove the outside rough surface, and most of the scale and rust. The castings should have a soft, gray, silky appearance when they come from the sandblast, and should be absolutely clean in all corners and inaccessible places. They should not be allowed to stand three or four days to oxidize and rust before using.

After sandblasting, the castings are given a light pickle in a solution made up of one carboy of muriatic acid, one carboy of hydrofluoric acid and 120 gallons of water. (Caution: Be very careful in handling the hydrofluoric acid as it is very corrosive to the flesh and produces painful and serious burns.) It is necessary to use hydrofluoric acid to dissolve any sand left in the surface of the castings. Muriatic acid dissolves scale and oxide.

After pickling in the solution at 100 to 120 degrees Fahrenheit (it will take half to three-quarters of an hour), the castings are taken out and placed in a clean rinse water bath and stored there until ready for use. When they are to be galvanized they are taken from the water storage tank and given a dip in hot muriatic acid (about 5%) and then put into the flux after they have been dried thoroughly on a dryer connected to the galvanizing furnace. Small castings are done on forks and larger castings are done with special hooks. Some companies use a zinc ammonium chloride liquid flux dip in preference to the muriatic acid before galvanizing.

The temperature of the galvanizing pot should be as low as possible, preferably 820 to 840 degrees Fahrenheit. A large number of castings should not be put in the bath at one time as they become soft if left in the bath too long. Larger castings are drawn out, drained thoroughly, and given a short dip in a water bath. Small castings on forks are drawn out and slid into a small tank of water with a light coating of oil over the surface. They fall on a perforated screen and are immediately lifted out of the water and stored in barrels or containers.

Revised Chromium Plating Regulations

By OUR LONDON CORRESPONDENT

British Government Regulations to Meet Health Hazard*

DURING 1930, the Home Office provided a number of regulations which were to be specially applicable to the British chromium plating industry under the Factory and Workshop Act of 1901. The drafted regulations were discussed with representatives of the electroplating industry, and in particular the Standards Committee of the Electro-Platers' and Depositors' Technical Society, which convened a meeting specially to discuss this matter. The regulations have now been revised in the light of the suggestions which were forthcoming at this discussion, and the revised draft has now been issued by H. M. Chief Inspector of Factories. The Home Office calls for any further objections which the new draft may arouse to be forwarded in writing to him by April 30th, 1931. It is probable that the revised regulations, which are appended below, will thereafter, with some possible slight amendments, become law.

Some of the objections which were recently raised have been met as follows.

Originally one of the requirements was that workers employed at a chromium plating bath should be provided with rubber boots, and with aprons and bibs of rubber or leather. Some latitude is now given in respect of the materials which may be used. This particular requirement does not affect employees who wire or rack the work preparatory and subsequent to plating.

Two new regulations which have been inserted are to the following effect.

(1) The provisions of an adequate supply of wholesome drinking water (a requirement already applying to all factories and workshops employing 25 or more people) and

(2) **Employees under the age of 18 are prohibited from working as chromium platers.**

One of the objections was to the effect that the anodic oxidation process does not come in the same category as chromium plating, since a much weaker solution is used, and a lower current density, and therefore exhaust ventilation was largely unnecessary. On investigation the Factory Department reported that in some instances chromic acid was found in the air immediately over the baths used in the anodic oxidation process, although it appeared that in certain cases the amount of acid in the atmosphere may be negligible and therefore harmless. While, however, the anodic oxidation process cannot be excluded from these regulations, exemption may be granted by the Chief Inspector at his discretion.

Considerable criticism had been made by the chromium plating industry at the proposed fortnightly medical examination on the grounds that the interval between examinations could be extended without undue hazard, but the Secretary of State, in the revised regulations, does not appear to be willing to agree to any relaxation of this requirement, on the grounds that chromic acid very rapidly affects the skin and mucous membrane of the nose; but the period between examinations would be extended in cases where it was found after trial that this could be allowed without increasing the health hazard.

REVISED DRAFT OF PROPOSED REGULATIONS

In pursuance of the above Section the Secretary of State hereby makes the following Regulations and directs that they shall apply to all factories and workshops or parts thereof in which the electroytic plating or oxidation of metal articles by the use of an electrolyte containing chromic acid or other chromium compounds is carried on.†

Definitions

Electrolytic chromium process means the electrolytic plating or oxidation of metal articles by the use of an electrolyte containing chromic acid or other chromium compounds.

Bath means any vessel used for an **electrolytic chromium process** or for any process subsequent thereto.

Employed means, in Regulations 3, 4, 5, 7, 8, 10, 12 and 13, employed in any process involving contact with liquid from a **bath.**

Surgeon means the Certifying Surgeon of the district or a duly qualified medical practitioner appointed by written certificate of the Chief Inspector of Factories which appointment shall be subject to such conditions as may be specified in that certificate.

Suspension means suspension from employment in any process involving contact with liquid from any **bath** by written certificate in the Health Register, signed by the **Surgeon,** who shall have power of suspension as regards all persons employed in any such process.

Exceptions

Where it is proved to the satisfaction of the Chief Inspector of Factories that by reason of exceptional circumstances in any works subject to these Regulations, or by reason of the infrequency of the process, or for other reasons, all or any of the requirements of the Regulations are not necessary for the protection of persons employed in such works, he may by certificate in writing (which he may in his discretion revoke) exempt such works from all or any of the provisions of the same, subject to such conditions as he may by such certificate prescribe.

Duties

It shall be the duty of the occupier to observe Part I of the Regulations.

It shall be the duty of every person employed to observe part II of these Regulations.

* For previous articles on this subject see THE METAL INDUSTRY for September, 1930, pages 431-2, and April, 1931, pages 161-3.

† These Regulations may be cited as the "Chromium Plating Regulations, 1931," and shall come into force at a date yet to be fixed.

PART I.—DUTIES OF OCCUPIERS

1. At every vessel in which an electrolytic chromium process is carried on, an efficient exhaust draught shall be provided by mechanical means and shall operate on the vapour or spray given off as near as may be at the point of origin, so as to prevent it entering into any room in which persons work.

2. The floors of every room containing a bath shall be rendered even and impervious to water, maintained in a sound condition, and washed down daily.

3. The occupier shall provide and maintain in good condition (a) for the use of all persons employed, aprons with bibs; and (b) for the use of those working at a bath loose-fitting rubber gloves of suitable length, and rubber boots or other waterproof footwear.

The aprons and bibs shall be of sufficient length and suitable material, which in the case of persons working at a bath shall be rubber, leather or some other impermeable material.

4. The occupier shall provide and maintain for the use of all persons employed suitable accommodation for the storage and adequate arrangements for the drying of the protective clothing required under Regulation 3.

5. (a) The occupier shall provide and maintain in a cleanly state and in good repair for the use of all persons employed a lavatory, under cover and conveniently accessible, with a sufficient supply of clean towels, renewed daily, and of soap, nail brushes and suitable ointment, and with either—

(1) a trough with a smooth impervious surface fitted with a waste pipe without plug, and of such length as to allow at least two feet for every five such persons, and having a constant supply of warm water from taps or jets above the trough at intervals of not more than two feet; or

(2) at least one lavatory basin (which in the case of lavatories installed after a date to be prescribed shall be not less than twenty inches long by seven inches deep) for every five such persons, fitted with a waste pipe and plug or placed in a trough having a waste pipe and having either a constant supply of hot and cold water or warm water laid on, or (if a constant supply of heated water be not reasonably practicable) a constant supply of cold water laid on and a supply of hot water always at hand when required for use by persons employed.

Provided that the provision of suitable ointment in the lavatory shall not be required, if every person employed is kept constantly supplied with a collapsible tube containing such ointment.

5. (b) This Regulation shall also extend to persons engaged in subsequent polishing or finishing by aid of mechanical power involving exposure to chromium oxide or other compounds of chromium.

6. There shall be provided and maintained at suitable points, conveniently accessible at all times to all persons employed:

(a) An adequate supply of wholesome drinking water from a public main or from some other source of supply approved in writing by the local authority of the district in which the factory is situated, which shall be either laid on, or contained in a suitable vessel;

(b) (except where the water is delivered in an upward jet from which the workers can conveniently drink) at least one suitable cup or drinking vessel at each point of supply, with facilities for rinsing it in drinking water.

Each drinking water supply shall be clearly marked "Drinking Water."

All practicable steps shall be taken to preserve the water and vessels from contamination.

7. The occupier shall make such arrangements for First-Aid treatment of injuries to persons employed as will comply with the requirements laid down for factories in Section 29 (i) of the Workmen's Compensation Act, 1923, and in addition shall see that each First-Aid Box is provided with a sufficient supply of ointment and impermeable waterproof plaster.

8. (a) Every person employed shall be examined by the Surgeon once in every 14 days, or at such other intervals as may be specified in writing by the Chief Inspector of Factories, on a day of which due notice shall be given to all concerned, and such examinations shall normally be made at the factory or workshop.

(b) A Health Register containing the names of all persons employed shall be kept in a form approved by the Chief Inspector of Factories.

(c) No person after suspension shall be employed without written sanction from the Surgeon, entered in or attached to the Health Register.

9. A young person under the age of eighteen years shall not be allowed to work at a bath.

Provided that this Regulation shall not apply to any young person already so employed on (date yet to be fixed).

10. The occupier shall see that the official Cautionary Placard as to the effects of chromium on the skin is affixed in the works in such a position as to be easily read by the persons employed, and shall arrange for inspection of the hands and forearms of all persons employed to be made twice a week by a responsible person, and for a record of such inspections to be kept in the Health Register.

PART II.—DUTIES OF PERSONS EMPLOYED

11. No person employed shall misuse or without the concurrence of the occupier or responsible person in charge interfere with any appliance provided in pursuance of these Regulations.

12. Every person employed shall wear the protective clothing provided under Regulation 3, and shall deposit the protective clothing when not being worn in the place provided under Regulation 4.

13. (a) Every person employed shall present himself at the appointed time for examination by the Surgeon in pursuance of Regulation 8 (a).

(b) No person after suspension shall work in any process involving contact with liquid from any bath without written sanction from the Surgeon, entered in or attached to the Health Register.

Metal Testing Reports*

REPORT OF RESEARCH COMMITTEE: ON FATIGUE OF METALS. H. F. MOORE, CHAIRMAN.

Report on publication of abstracts. Reported progress on work of publishing summary of present-day knowledge of fatigue of metals.

REPORT OF COMMITTEE A-10: ON IRON-CHROMIUM, IRON-CHROMIUM-NICKEL AND RELATED ALLOYS. JEROME STRAUSS, CHAIRMAN.

A report on the activities of the general committee and sub-committee. A specification committee has been authorized. Tables of Chemical Compositions, Physical and Mechanical Properties and Corrosion-Resistant Properties of Corrosion-Resistant and Heat-Resistant Alloys were completed by Subcommittee I. (See page 310 of this issue of THE METAL INDUSTRY for a review of this publication.)

* For a report of the Annual Meeting of the American Society for Testing Materials, see page 300 of this issue.

Barrel Plating with Zinc-Cadmium Alloys

By LAWRENCE E. STOUT and I. KOWARSKY

Associate Professor of Chemistry and Student, Respectively, Washington University, St. Louis, Missouri.

An Investigation to Determine the Best Alloys of Zinc and Cadmium for Electro-deposition for Rust-Proofing Purposes.

A PAPER READ AT THE CONVENTION OF THE AMERICAN ELECTROPLATERS' SOCIETY AT ROCHESTER, N. Y., JUNE 29-JULY 2, 1931.

IN a previous article by one of the authors[1] a report was made concerning the relative resistance to corrosion of a wide range of electrically deposited zinc-cadmium alloys. The findings in that article pointed to two classes of alloys of these materials. Zinc, being cheaper than cadmium, makes it an attractive substitute for the latter whenever conditions permit. The question is, how much zinc can be substituted for cadmium in the deposit before the rustproofing property of this deposit is injured? Results of the investigation indicated above point out that the highest grade zinc-cadmium alloy may contain from 15-20 per cent of zinc. This alloy is superior to electrolytic cadmium as a rustproofing agent, lasting from 25 to 30 per cent longer in a salt spray before the film breaks down. Another class of alloy, higher in zinc content and consequently cheaper to apply may contain as much as 75 per cent zinc. This alloy shows approximately the same resistance to corrosion, as measured by salt spray corrosion test. Higher concentrations of zinc cause a rapid decrease in the resistance to corrosion.

Many commercial objects to be rustproofed are small and the racking of each piece becomes a serious problem. The desirability of barrel plating is obvious to all who have ever dealt with production in electroplating work. However, such barrel plating makes certain demands upon the process above those which are required for still plating. The deposit must be relatively free from defects produced by small changes in current density and must be capable of giving a good deposit even when the current is periodically interrupted as it must be when the barrel is used.

The alloys prepared by Stout and Faust were plated from a still tank. In fact, it was impossible at that time to introduce even a mild agitation without producing a serious streaking and pitting on the surface of the deposit. Experimental evidence at that time pointed to the fact that this pitting was not due to the major constituents of the bath but was due to the addition agents employed. Barrel plating from such a bath was out of the question. This bath also showed a tendency to give a burned deposit on the edges. This was found to be due to another of the salts present in the bath as formulated.

Therefore, in casting around for the desirable characteristics of the bath it was decided that the barrel plating solution must be of simpler composition than the bath previously reported. It is the belief of one of the authors that a properly formulated bath, correctly operated, does not need the various addition agents and the foreign salts (i.e. sodium sulfate, sodium tartrate, nickel sulfate, and mercuric oxide) specified in the other paper. The essential constituents are an aqueous solution of zinc cyanide and cadmium cyanide, in the presence of sodium cyanide and sodium hydroxide. Chemically there is no demand for any other chemical substance. Such a bath may be formulated on either a low free alkali or a high free alkali basis. The low free alkali basis is more satisfactory, in general, because it has a smaller tendency to pick up carbon dioxide from the air with the resultant abnormal rate of accumulation of sodium carbonate in the bath.

Investigations carried out in this laboratory have pointed out that high sodium sulfate contents of the bath suggested by Stout and Faust increase the tendency towards burned deposits. It was decided that this was the first constituent to be deleted, if possible. Other experiments indicated that the pitting referred to above, when the previous solution was stirred, was due to finely divided carbon. Experiments showed that some of the sodium tartrate used as an addition agent in the previous bath was electrolytically oxidized at the anode and produced finely divided or colloidal carbon residues in the bath. Therefore, it was demonstrated that sodium tartrate or tartaric acid additions were to be avoided if possible. Since there is little possibility of iron impurities in the bath the omission of this constituent offers little difficulty.

At the time that this investigation was in progress, little or no work on the barrel plating of a zinc-cadmium alloy had been published. A patent granted to Wernlund[2] in 1924 describes a method of still plating a low cadmium, high zinc alloy on wire screen from a high zinc and low cadmium bath. Of barrel plating, the patent states that the alloy can be plated by this method but that very careful control along with certain changes in the bath are necessary. In a recent paper[3], Wernlund again describes a method for plating a high zinc, low cadmium alloy from a still cyanide bath having high zinc, high alkali, and low cadmium contents. Since a bath high in cadmium and low in zinc and alkali contents was desired for this investigation, the literature offered little help for its starting point.

Apparatus

A LaSalco Utility Barrel Plater was used in an unagitated solution for the actual plating. The small size

[1] Stout and Fasut, THE METAL INDUSTRY, 28, 381 (1930).

[2] Wernlund, United States Patent 1,518,622, Dec. 9, 1924.

[3] Wernlund, The Monthly Review (American Electroplaters Society), 17-11, 4 (1930).

and ease of handling of this type of plater made it especially desirable for this work. The plating solution was contained in a sheet steel tank of dimensions 18 x 36 inches. Stick cadmium anodes were suspended from heavy brass bars on both sides of the barrel by means of battery clamps and wires. An anode to cathode area of approximately 1:1 was maintained in this work. Modifications of this electrode arrangement will be discussed later in connection with the maintenance of the solution.

Objects Plated

Stove bolts, ¼ inch x 2 inches were placed in the Utility Barrel to receive the coating of electrically deposited alloy. This type of cathode was selected because it would serve to show up most quickly any defects in the process. Throwing power of the bath must be good or the deposit will not extend into the recesses of the threads and to the bottom of the screw slot in the head. Such irregularities in shape would give ample opportunity for burning at some of the edges if such a tendency existed in the process.

The stove bolts were prepared for plating in the following manner: They were first washed free of any unsaponifiable oils they may have received from their previous handling. A carbon tetrachloride-benzene mixture was used for this purpose. Next, they were placed into a hot alkaline cleaner[4] for 10 minutes. After this, they were washed with water and pickled in a 50 per cent hydrochloric (muriatic) acid solution for 10 minutes. They were then removed from the pickling bath, washed with water and immediately placed into the barrel plater.

In the plating operation, enough bolts to make ½ square foot (24) were used. A 1:1 cathode to anode ratio was used, so the anode surface was also adjusted to ½ square foot. The barrel was then placed into the bath and started rotating. The current was adjusted to the required strength and deposition was allowed to continue long enough to give a large enough deposit for analysis. At the conclusion of the deposition, the bolts were removed from the barrel and washed with water. The deposits were then analyzed by the method described below.

Method of Analysis

Because of their great similarity, it is very difficult to quantitatively separate cadmium and zinc. The standard method[5] of successively precipitating with H_2S (sometimes requiring 4 separate precipitations) is long and tedious, and is not apt to be very accurate because of the numerous precipitations. For this investigation, an indirect method was developed. This method has the advantages of being rapid and accurate enough for the purpose required. Four marked bolts were thoroughly cleaned and dried, and accurately weighed before plating. They were then plated in the barrel along with 20 other bolts. After plating, they were washed, dried, and then weighed. In each case, the difference between the last and original weighings represented the weight of the deposit. The deposits were then dissolved in 10 cc. of concentrated hydrochloric acid. When the solutions started to become yellow due to iron dissolving, the bolts were removed and washed, the washings being returned to the original solution. The solutions were boiled with 5 cc. of bromine water in order to oxidize any ferrous iron to the ferric state. After boiling for several minutes to remove the excess bromine, ammonium hydroxide was added until the iron precipitated, and 10 cc. excess was added to redissolve any zinc or cadmium hydroxide. This solution was filtered and then neutralized to a methyl orange end point with hydrochloric acid. An excess of 5 cc. of concentrated hydrochloric acid was added and the whole diluted to 200 cc. Ordinarily, 5 g. of ammonium chloride must be added, but in this case, enough of the salt had been formed when the solution was neutralized. This solution was heated almost to boiling and then titrated with a standard potassium ferrocyanide solution prepared according to the directions of Blum and Hogaboom.[6] A uranium acetate solution was used as an outside indicator. From the weight of the alloy and the volume of standard solution required, the weight of each metal was found by solving two simultaneous equations.

[4] Blum and Hogaboom—"Principles of Electroplating & Electroforming," McGraw-Hill Book Company, New York, 1930, 2nd edition, Page 145.
[5] Scott, "Standard Methods of Chemical Analysis," Vol. 1, The Van Nostrand Company, New York, 1925, 4th ed. p. 102.

Results

Three different baths were developed in the course of this investigation. In no case was the use of addition agents required. Bath number one the low cadmium alloy had the following composition: Cadmium oxide, 3.7 ounces per gallon; sodium cyanide, 9.7 ounces per gallon; zinc cyanide, 0.8 ounces per gallon; sodium hydroxide, 1.1 ounces per gallon. This bath was found to give an alloy of the composition that lasted almost as long as pure cadmium in the salt spray.

This low cadmium alloy has the desirable property of a very high throwing power. The tests made on the stove bolts never showed a failure to have the deposit completely cover the surface of the bolt into the slot on the head and to the bottom of each thread. Quantitative measurements of the throwing power were not made but it is obvious from the type of work plated in the barrel that the throwing power is more than sufficient for plating any objects ordinarily handled in a barrel.

The effect of current density and temperature upon the composition and appearance of the alloy deposited are indicated in Tables I and II:

TABLE I. COMPOSITIONS AND CURRENT EFFICIENCIES OBTAINED WITH BATH 1

Run No.	Voltage Volts	C. D. Amp. per sq. ft.	Time Minutes	Temperature ° F.	Deposit % Zn	Deposit % Cd	Cathode Current Efficiency
1	6.5	25-30	25	72	63	37	40
2	6.0	20-30	15	74	63	37	35
3	11.0	60-80	10	72	61	39	40
4	11.0	80	7	100	53	47	40

TABLE II. BRIGHTNESS OF DEPOSITS OBTAINED WITH BATH 1

Temperature ° F.	Cathode Current Density Amp./sq. ft.	Brightness of Deposit
72	10	Dull
72	15	Dull
72	20	Dull
72	25	Bright
72	30	Very Bright
74	40	Bright
74	50	Medium
74	60	Dull
74	90	Dull
100	80	Very Bright

A study of the results in Table I show many interesting things. This bath gives a deposit well within the limits for the 98 hour alloy. Between the current densities used, the cathode current efficiencies seemed to remain constant at about 40 per cent. Increase in the current density raises the cadmium content of the deposit. An increase in the temperature of the plating bath, as indicated in Run No. 4, also increases the cadmium content of the alloy. The deposit obtained from the bath at 100° F. and with a current density of 80 amperes per

[6] Ref. 4, p. 325.

square foot, was remarkable in that its brightness, as it came from the bath, was almost equal to that of platinum. It was easily polished to a very high luster by mere rubbing with a cloth. In fact, all the deposits came out bright and were easily polished to a high luster. The deposits obtained at high current densities required somewhat harder rubbing before they became as bright as those obtained at lower current densities which were easily polished with light rubbing. From this fact, it was assumed that the deposits obtained at high current densities are somewhat harder than those obtained at low current densities.

Table II shows how the brightness of the objects when they leave the barrel plater varies with the current density. During this test, the temperature, total area, and anode to cathode ratio were kept constant. It can be seen that at these lower temperatures the brightest deposits come out in the current density range of 25-40 amperes per square foot, the best being at 30. This seems to be contradictory to the very bright deposit obtained from the high temperature high current density bath. The probable explanation for this is that the bright current density range goes up with increasing temperature. In all cases, dull deposits were due to coarse crystalline structures.

This bath seems to be ideal with respect to current density limit. As far as could be determined, there is no limit. With the highest current density obtainable (90 amperes per square foot) when using the barrel unit, the deposit was somewhat coarse, but showed absolutely no signs of burning. In a still bath, the current density was allowed to go up to several hundred amperes per square foot, and the deposits still came out bright and without any signs of burning. The fact that the bath works equally well for barrel plating or for still plating is very interesting. During an Engineers' Day exhibition at Washington University this bath was used for plating several hundred small articles such as keys and charms. Although unheard of current densities were used, every object came out perfect, and was easily buffed to a high luster by a coloring brush. These exhibition platings brought out the fact that objects made of steel, brass or copper received equally good deposits.

In order to study the barrel plating of alloys of higher cadmium contents two other baths were made up containing increasing quantities of cadmium oxide and lower concentrations of zinc cyanide. Bath number two had the following composition: cadmium oxide 4.0 ounces per gallon; sodium cyanide 9.7 ounces per gallon; zinc cyanide 0.3 ounce per gallon; sodium hydroxide 1.1 ounces per gallon. As may be seen from Table III the composition of the resulting alloy fell short of the desired cadmium content. In all other respects it was an ideal coating. Nothing was left to be desired as regards its physical form, throwing power, adherence to the base metal and freedom from burning at high current densities.

Bath number three containing a still higher cadmium to zinc ratio was of the following composition: cadmium oxide, 5.1 ounces per gallon; sodium cyanide 9.7 ounces per gallon; zinc cyanide 0.1 ounce per gallon; sodium hydroxide 1.1 ounces per gallon. The deposit from this bath approximated the desired cadmium content. It was as workable as was the other baths and as in the other cases the deposit was remarkably free from troubles of burning, pitting, streaking, and off color deposits.

A peculiar condition developed in the study of the deposits obtained from these baths. In every case it developed that an object plated in the barrel had a lower cadmium content than one plated from the same bath by ordinary racking methods using the bath as a still plating solution. Table III gives the results of these studies:

TABLE III. COMPOSITION OF DEPOSITS FROM STILL AND AGITATED BATHS

Bath No.	Cathode C. D. Amp./sq. ft.	Temperature ° F.	Still % Cd	Still % Zn	Agitated % Cd	Agitated % Zn
1	60-80	72	50	50	39	61
2	80	75	76	24	65	35
3	80	76	84	16	78	22

The data presented in tables I and III indicate that the zinc plates out more rapidly from the baths than the cadmium. This is contrary to the findings of Stout and Faust. However, in this work, the bath contains low free alkali and low free cyanide while the previous work by one of the authors dealt with a bath of high free cyanide and alkali contents. It is easy to see, chemically, that free alkali would reduce the tendency for zinc to plate out, but would affect the cadmium, but little.

It is evident that such a bath as indicated would soon become depleted in its zinc content when operated with cadmium anodes. The bath may be maintained in one of two ways. For operation where adequate chemical control is available periodic additions of zinc cyanide solution will serve to maintain the desired zinc content. This may be done by removing a portion of the bath and fortifying it by adding the required amount of zinc cyanide. Some small amount of sodium hydroxide or sodium cyanide may be needed if the content of the bath has become somewhat depleted in these constituents. A second method for adding the zinc to the bath is to use mixed anodes. The relative areas of cadmium to zinc used can be varied according to the operating needs of the bath. For the low cadmium bath it was found that 20 per cent of the anode area as zinc was satisfactory while from 5 to 10 per cent of the area as zinc was adequate when the high cadmium alloys were sought. **In any event chemical analysis of the bath is advisable if the maximum in results is to be expected.** Such is true not only of this bath but with most of the modern plating solutions. Chemical control of these solutions will have to replace "rule of thumb" operations if uniformly good results are to be expected.

Summary and Conclusions

1. Bright zinc-cadmium alloys of various compositions can be barrel plated from low alkali, cyanide baths that are high in cadmium and low in zinc contents.
2. The same baths will work equally well for barrel plating or for still plating.
3. The baths have excellent throwing powers.
4. Very high current densities can be used without burning the deposits.
5. Bright deposits are obtained without the aid of addition agents.
6. All deposits can be buffed to a very high luster.
7. At room temperature (70° F.) the brightest deposits are obtained from current densities between 25 and 40 amperes per square foot.
8. At elevated temperatures, bright deposits can be obtained from higher current densities.
9. All the deposits adhere well.
10. Equally good deposits are obtained on base metals of steel, brass, or copper.
11. The percentage of cadmium in the deposit can be increased by increasing the current density, the temperature, or both at the same time.
12. All other things being equal, cadmium will plate out in greater percentages from still baths than from agitated baths.

Acknowledgment is made to the LaSalco Corporation, 2828 LaSalle Street, St. Louis, Missouri, for contributing the Utility Barrel plating apparatus and tank used in this investigation.

Testing Materials Society Meeting

A Report of the 34th Annual Meeting of the American Society for Testing Materials in Chicago, Ill., June 22-26, 1931. Special Exhibits and Important Technical Sessions Held.

THE 34th annual meeting of the American Society for Testing Materials was held in Chicago, Ill., at the Hotel Stevens, June 22-26, 1931. At this meeting the following officers were elected for the fiscal year:

President, Frank O. Clements, Technical Director of Research Laboratories, General Motors Corporation, Detroit.

Vice-president, Samuel T. Wagner, Consulting Engineer, Reading Company, Philadelphia, Pa.

Members of Executive Committee:

Arthur W. Carpenter, Manager, Testing Laboratories, B. F. Goodrich Company, Akron, Ohio.

Kenneth B. Cook, Technical Manager, Manville Jenckes Company, Pawtucket, R. I.

J. B. Johnson, Chief, Material Branch, Material Division, U. S. Army Air Corps., Wright Field, Dayton, Ohio.

George C. D. Lenth, Consulting Engineer, Chicago, Ill.

O. L. Moore, Engineer of Tests, Universal Atlas Cement Company, Chicago, Ill.

Special Features

Besides the regular reports of committees and technical papers (abstracts of which are given below) the meeting included a number of special features. On Wednesday, June 24, Dr. A. Nadai, research engineer, Westinghouse Electric and Manufacturing Company, delivered the sixth Edgar Marburg lecture in "The Phenomenon of Slip in Plastic Materials." On Wednesday evening, June 24th, the American Society for Testing Materials dinner was held at which the fifth award of the Charles B. Dudley Medal was given to Professor A. H. Pfund, author of the paper on "Hiding Power Measurements in Theory and Application," presented at the 1930 annual meeting. On Thursday evening, June 25th, a joint session was held with the Western Society of Engineers, on the subject of "The Economic Significance of Specifications for Materials."*

Exhibits of Apparatus

A special exhibit of testing apparatus and machines was held, the features being some unusually small testing machines which effectively determine properties of the materials to be tested. For example, one special hydraulic testing machine shown, exerts a pull of only 60 pounds and is useful for making cross bending tests of flat springs in connection with a study of hydrogen embrittlement. The Bell Telephone Laboratories showed a fatigue machine for sheet metals designed to test simultaneously 40 specimens of sheet metal of varying thicknesses. The development of this machine has increased materially, the prospects of securing adequate fatigue results on non-ferrous alloys within a reasonable length of time.

Besides the equipment listed above, seven research institutions displayed special apparatus and twenty-seven industrial companies had on view a variety of apparatus, machines and equipment for testing materials.

The usual entertainment features were scheduled consisting of a dinner dance and smoker, a golf tournament, tennis tournament and a variety of entertainments for the ladies.

* For comment on this session, see THE METAL INDUSTRY for June, 1931, page 263.

Technical Papers and Reports

REPORT OF JOINT RESEARCH COMMITTEE OF A.S.M.E. AND A.S.T.M: ON EFFECT OF TEMPERATURE ON THE PROPERTIES OF METALS. H. J. FRENCH, CHAIRMAN.

A brief résumé of activities of the committee, containing a detailed technical report on high-temperature fatigue tests in progress and a report covering creep tests. Paper appended: Apparatus for Low-Temperature Endurance Testing. H. W. Russell and W. A. Welcker, Jr.

HIGH-TEMPERATURE CHARACTERISTICS OF METALS REVEALED BY BENDING. HOWARD SCOTT.

Testing technique for determining the strength of metals at high temperatures by heating specimens in the form of flat strips constrained to different curvatures and measuring the change in curvature of the strips produced thereby. From such observations the strain at the proportional limit of the metal at the test temperature can be evaluated. The test results on annealed nichrome were given and discussed.

Symposium on Effect of Temperature on the Properties of Metals

This symposium was arranged to provide an opportunity to discuss the engineer's needs for materials to withstand high temperatures and stresses and just how well available materials meet these requirements. It continues the work of a symposium on the same subject held in 1924.

Trends in Engineering Requirements for Metals for Power Plant Industry—Steam Boiler and Superheater Division. H. J. Kerr.

Trends in Engineering Requirements for Turbines. R. C. Allen.

Metallurgical Requirements for High-Temperature Steam Piping. F. W. Martin.

Needs of the Oil Industry. E. S. Dixon.

Corrosion and Other Problems in the Use of Metals at High Temperatures in the Chemical Industries. F. H. Rhodes.

Engineering Requirements and Trends for Metals in the Metal Industries, Especially in Furnaces for Heat Treating Steel, Galvanizing, etc. J. C. Woodson.

Engineering Requirements and Trends for Metals in the Non-Ferrous Roasting, Smelting and Refining Industry. R. E. Brown.

Engineering Requirements in the Automotive Industry for Metals Operating at High Temperature. A. L. Boegehold and J. B. Johnson.

Use of Metals at Elevated Temperatures in the Ceramic Industry. C. E. Williams.

The Trend of Progress in Great Britain on the Engineering Use of Metals at Elevated Temperatures. R. W. Bailey, J. H. S. Dickenson, N. P. Inglis and J. L. Pearson.

The Mechanical Properties of Metals at Elevated Temperatures. Pierre Chevenard.

Zinc Alloys for High and Low Temperature Service. H. A. Anderson.

The Mechanical Properties of Aluminum and Magnesium Alloys at Elevated Temperatures. R. L. Templin and D. A. Paul.

Properties of Bearing Metals at Normal and Elevated Temperatures. E. R. Darby.

Properties of Copper and Some of Its Important Industrial Alloys at Elevated Temperatures. W. B. Price. (With discussion by W. H. Bassett.)

The Effect of Temperature on Some Properties of Iron-Chromium-Nickel Alloys. N. B. Pilling and Robert Worthington.

Nickel and Nickel Alloys Other than the Nickel-Chromium-Iron Group. C. A. Crawford and Robert Worthington.

Properties of the Rare Metals for High-Temperature Service. W. H. Swanger.

Effect of Low Temperatures on the Properties of Metals. H. W. Russell.

Thermal Expansion of Metals in Relation to High-Temperature Service. N. L. Mochel.

Note on Applications of Data on the Thermal Conductivity of Metals. M. S. Van Dusen.

Bibliography of Recent Literature on Effect of Temperature on Properties of Metals. L. F. McCombe.

Non-Ferrous Metals, Metallography

REPORT OF COMMITTEE B-2: ON NON-FERROUS METALS AND ALLOYS. WILLIAM CAMPBELL, CHAIRMAN.

A brief report of progress proposing a new method for chemical analysis of silver solders.

REPORT OF COMMITTEE B-5: ON COPPER AND COPPER ALLOYS, CAST AND WROUGHT. C. H. MATHEWSON, CHAIRMAN.

Reported acceptance by Committee on Standards of tentative specifications for copper-base alloys in ingot form for sand castings and progress in development of proposed specifications for copper water tube.

FATIGUE TESTS IN SHEAR OF THREE NON-FERROUS METALS. H. F. MOORE AND R. E. LEWIS.

Fatigue tests in reversed flexure (rotating-beam tests), tests under cycles of reversed shearing stress (torsion), and tests under cycles of shearing stress varying from zero to a maximum, made on copper, brass and duralumin. Data showing the ratios of endurance limit in reversed shear to endurance limit in reversed flexure, and endurance limit in reversed shear to endurance limit under shear varying from zero to a maximum. Described the special torsion fatigue machine used.

THE STATIC AND FATIGUE PROPERTIES OF BRASS. J. B. KOMMERS.

Presented results of tests made on brass bars of three different compositions in the form of cold-drawn ¾-in. rounds as received, after being fully annealed, after a low-temperature anneal, and also after being fully annealed and then subjected to various amounts of cold work in tension and compression. Showed the great effectiveness of a low-temperature anneal, following cold work, in improving the static and fatigue properties.

REPORT OF COMMITTEE B-7: ON LIGHT METALS AND ALLOYS, CAST AND WROUGHT. J. B. JOHNSON, CHAIRMAN.

REPORT OF COMMITTEE B-6: ON DIE-CAST METALS AND ALLOYS. H. A. ANDERSON, CHAIRMAN.

The results of one-year outdoor exposure tests of aluminum and zinc-base die-cast specimens; additional studies of zinc-base alloys in hot humid atmospheres; reorganization and extension of die-casting investigational activities. Presented specifications for aluminum-base die-casting alloys and for zinc-base die-casting alloys. **Paper Appended:** "Effect of Composition on Aluminum Die-Casting Alloys," by D. L. Colwell.

REPORT OF COMMITTEE B-3: ON CORROSION OF NON-FERROUS METALS AND ALLOYS. T. S. FULLER, CHAIRMAN.

Progress on and extension of atmospheric exposure test program to include two additional test locations on the Pacific Coast.

REPORT OF COMMITTEE B-4: ON ELECTRICAL-HEATING, ELECTRICAL-RESISTANCE AND ELECTRIC-FURNACE ALLOYS. DEAN HARVEY, CHAIRMAN.

Progress on comparative tests of life of heater wires in service and in accelerated life test, on development of bend test to determine elastic properties of alloys at high temperatures and on development of methods of test for wrought and cast alloys for electric-furnace structural applications. Presented new tentative specifications for two grades of drawn or rolled alloy, 60-per-cent nickel, 15-per-cent chromium, balance iron and an 80-20 nickel-chromium alloy for electrical heating purposes, also a method of test for determining the temperature-resistance constants of resistance alloys.

Corrosion and Fatigue of Metals

REPORT OF COMMITTEE A-5: ON CORROSION OF IRON AND STEEL. J. H. GIBBONEY, CHAIRMAN.

Reported additional failures in total immersion tests and results of first failures of metallic coatings at five locations. Reported progress on steel embrittlement investigation and outlined cooperative work to be undertaken with American Electroplaters' Society on certain plated coatings on iron and steel which are of public interest.

REPORT OF SECTIONAL COMMITTEE: ON SPECIFICATIONS FOR ZINC COATING OF IRON AND STEEL. J. A. CAPP, CHAIRMAN.

Announced development of proposed specifications for hot-dipped galvanized hardware products.

ACCELERATED CORROSION TESTS OF SPRAYED MOLTEN METAL COATINGS IN AN SO_2-CO_2-AIR ATMOSPHERE. LEOPOLD PESSEL.

Presented data on specimens of tank steel sprayed with various metals, alloys and combinations of these.

The Fundamentals of Brass Foundry Practice

By R. R. CLARKE
Foundry Superintendent

A Description of the Basic Laws Which Control the Melting and Casting of Metals and Their Application to Practical Foundry Work—Part 26.*

NICKEL ALLOYS

THE physical effect of nickel on the copper alloy is chiefly to strengthen and to harden the metal. For this purpose it is frequently used in very small percentages in the regular and ordinary copper alloys as Cu 88, Sn 10, Zn 2, or Cu 85, Sn 5, Zn 5, Pb 5. Results of various investigations from different sources seem to bear out the fact that this nickel addition raises the physical properties of the metal considerably, elongation, yield point, tensile strength and Brinnel hardness all showing an upward trend. The percentages of nickel supplied vary from ¼ to ½ per cent. In his own experience the author has never attempted over ¾ per cent in the average alloy; (this from the standpoint of cost as well as to avoid overdoing the thing to a result beyond the requirements in the case).

In introducing this nickel the best method is to use the copper-nickel hardener of 50 copper—50 nickel or 70 copper—30 nickel, in order to avoid higher temperature or longer time than necessary for incorporating the nickel.

HIGH NICKEL ALLOYS

Of those alloys of higher nickel content, three examples will be noted and practice submitted. Monel metal, nickel silver (or German silver) and a synthetic alloy of copper 50, nickel 50 used as an electrical resistance metal.

Monel metal is a natural alloy of about 65 per cent nickel, balance copper and slight traces of other metals. It has an extremely high melting point and in fluid condition is very hard on the sand of the mold. Many ordinary grades of molding sand of ordinary heat resistance break down under Monel metal and form the copious inclusions of slag that enter the casting mold to displace metal. For this reason a high refractory sand of high permeability is required and a facing of the best grade of plumbago is essential to a clean smooth casting. When drying the mold a silica wash answers the purpose admirably.

All high nickel copper alloys have heavy shrinkage and demand large feeding gates and risers. Wherever bulk is at all prominent or its variations at all sharp, the feeding demand is most insistent. Even in castings of thin uniform section, care must be taken at the gating points to form and size the gates against the heavy pull of shrinkage and the casting defects resulting from it.

Monel metal follows the general principle of low fluidity and rapid cooling rate of the high nickel copper class. It adds the further disadvantage of delivering to the mold unclean metal unless closely skimmed. The skim gates are, therefore, items of close calculation. They dare not be too large, or unclean metal will be carried through them. They must not be too small or the metal will freeze in them. In many instances the author has found it safest to use the thin multiple gate for running the casting and of pouring "double up" to escape the chance of mis-running.

Furnace practice on Monel calls for high temperature, quick delivery to the mold and pouring once the required temperature is attained. Aluminum and magnesium are the common deoxidizers, the latter the more popular in quantities of from ⅛ to ¼ oz. to the hundred pounds of Monel.

The synthetic alloy copper 50—nickel 50 or copper 55—nickel 45 is an electrical resistance metal whose conductivity is practically constant at different temperatures. The best melting practice is to charge the copper along with the nickel in either the form of nickel shot or in small thin pieces. The copper, of course, melts first and functions as a dissolving bath for the nickel. As this is a metal of specific conductivity, aluminum and magnesium are prohibited as deoxidizers and give place to silicon in quantities of ¼ to ½ oz. of silicon-copper to the hundred lbs. of metal. These figures are not arbitrary, but are often displaced by that quantity of silicon copper which will by trial produce a shrink in the metal of the gate.

The molding peculiarities and practice are similar to Monel metal, high temperature, heavy shrinkage, low fluidity and rapid cooling being its more outstanding characteristics. It is not quite so injurious to the sand as Monel, although much more so than the ordinary copper alloys.

Nickel silver is a copper-zinc-nickel alloy used mainly for ornamental purposes. It takes a high, lustrous finish and stubbornly resists tarnish. It forms a good base for silver plating and has the advantage of retaining for a while the silver appearance after the silver plating wears off in spots.

In practice the composition of the alloy varies widely.† Nickel is the controlling factor of the silvery appearance and ranges from 4 per cent to 20 per cent of the total. Zinc is included to about 25 per cent on the average, with copper as the balance. An alloy of 76 parts copper to

 This series will be collected and published in book form. Parts 1 to 25 inclusive were published in our issue of July, August, September, October and November, 1926; January, February, March, April, May, August, September, November and December, 1927; March, May, August, September and December, 1928; March, April and October, 1929; May, August and October, 1930.

† For a full list of nickel silver alloys, see A List of Alloys by Campbell, published by the American Society for Testing Materials.

20 parts zinc is distinctly yellow; 4 parts nickel added turns this yellow to a soft, mellow, golden paleness; 6 parts nickel carries it still further to the silvery whiteness, and so on up to 18 to 20 parts nickel when the color turns to a hard, nickel white. The higher the nickel content the harder the metal and the greater the resistance to tarnish. At 10 per cent nickel, the white polish lasts a long time, while at 4 per cent nickel, the polish, mellow, soft and somewhat golden, dulls in a little while.

A representative alloy frequently used by the author consists of 72 per cent copper, 20 per cent zinc, 8 per cent nickel. This alloy polishes beautifully to a good white and retains its lustre very creditably. The metal is fairly hard, decidedly tough and difficult to finish. But once finished, it has that beauty and stability necessary for satisfactory ornamentation. By juggling the zinc and the nickel, many varieties of color can be realized.

Some of the most satisfactory nickel silver of the author's making came from Monel metal scrap to get the nickel content, cold-rolled yellow brass scrap to get the zinc, balance virgin copper. A representative heat of 100 pounds of such composition would include Monel metal 12½ lbs., cold rolled yellow brass 50 lbs., virgin copper 37½ pounds. The melting is done in crucible under a charcoal covering, the copper and Monel being melted and the yellow brass slowly added. When displacing Monel metal with nickel shot, the copper and nickel are charged, and when they are melted the yellow brass is added. When using virgin metals throughout, the nickel and copper are melted and the zinc slowly added at a lowest fluid temperature of the copper-nickel bath, well covered with charcoal, maintaining the zinc quota as far as possible against losses by volatilization, and obtaining a thorough alloying of the zinc. To arrest volatilization, common salt is thrown on the metal surface during the zinc introduction. Incidentally the better the grades of virgin metal used such as lake or electrolytic copper and Bertha or Horsehead zinc, the higher will be the quality of the alloy.

Aluminum is the common deoxidizer and has the advantage of endowing the metal with better "running" capacity. The aluminum percentage, however, must be kept low or the metal by repeated melting becomes drossy and unsatisfactory. From ⅛ ounce to ¼ ounce of aluminum to the 100 pounds of alloy is a liberal margin of safety. Like all high zinc alloys nickel silver has heavy shrinkage and must be molded accordingly. The metal possesses to a considerable extent the conflicting disadvantages of low-fluidity and rapid cooling. The gating and pouring and feeding are similar to those of the high nickel alloys already noted. Clean, smooth castings are usually demanded and the sand should be as fine as the conditions will allow. A facing of sand mixed with sea coal (30 parts sand, 1 part sea coal) adds to the smoothness of the casting surface. The pouring sprue should be top funnelled to cope with hard pouring and the mold filled as rapidly as possible. In thin metal sections where dry cores occur, the cores should be as soft and collapsible as possible. The metal follows the general high zinc alloy tendency to misrun the casting and to run drossy when poured too cold. Consequently the warm side is the position of favor. The zinc difficulty with over-damp sand is a further characteristic of the alloy and sand tempered thoroughly on the dry side gives the better castings.

In melting over and over, nickel silver deteriorates rapidly and calls for constant upbuilding by new metal additions. The safest practice is to use at least 40 per cent new metal to 60 per cent of re-melt in making up the charge.

Many nickel silver castings have thin sections and are difficult to run. High pouring temperatures are, therefore, often imperative. Under these conditions the thing to do is to get the metal to that temperature and get rid of it immediately. Do not hold it there a minute longer than necessary. At high temperatures, the metal is a prey to "gassing" which rapidly becomes worse.

A further use for nickel in small percentages is its introduction into high lead copper alloys to aid the uniform distribution of the lead. The quota of nickel in these alloys is low (from ½ per cent to 1 per cent) and its function is to hold the free lead in uniform quantities throughout the mass. It is used in such alloys as copper 77, tin 4, lead 16, zinc 2½, nickel ½ or copper 69, lead 25, tin 5, nickel 1. In all such alloys, where free lead is present to a high degree, much depends upon the correct practice to obtain uniform metal, whether nickel or any other incorporating agent is used.

This series will be continued in an early issue.—Ed.

Copper Electrotyping

An abstract from a paper, "Addition Agents in Copper Electrotyping Solutions," by R. O. Hull and W. Blum, in the Bureau of Standards Journal of Research, September, 1930.

GLUE, dextrin, urea and phenol were the addition agents tried in an attempt to produce harder electrodeposits than are obtainable under conditions otherwise favorable for rapid deposition. Glue made the deposits hard but is difficult to control in the amounts required, 10 mg/l (0.0013 oz./gal). Dextrin and urea have no beneficial effect directly although the latter forms unknown products in the solutions after several hours of electrolysis which had some effect. Phenol forms decomposition products the nature of which have been identified and which impart the desired hardness to the deposit when high current densities are used. A method of analysis enabling adequate control is given. Phenol sulphonic acid, made by heating equal volumes of phenol and sulphuric acid at 212° F. for one hour, is added to the solution in an amount sufficient to give .13 oz./gal. of phenol. With a solution consisting of copper sulphate 33 oz./gal.; sulphuric acid 10 oz./gal.; a temperature of 95° to 104° F. and a current density of 230 to 280 amperes per square foot may be used with very good agitation. With fair agitation or at a lower temperature, 90 to 180 amperes per square foot may be used.

The use of these higher current densities is a development in the electrotyping industry of the last few years resulting in greater production for a given plant capacity and of immense value on rush jobs. The use of phenol improves the properties of the deposits so obtained.

A. KENNETH GRAHAM.

Cupola Melting of Brass

By T. MAULAND

Metallurgist, Deering Works, International Harvester Company, Chicago, Ill.

This Paper Describes the Melting of Brass in a Cupola When the Fuel Used Is of High Fixed Carbon Content. Alloys Melted Are the 85-5-5-5 and 80-10-10 Composition. The Castings Produced Consist Largely of Carburetors and Bushings.

A PAPER READ AT THE MEETING OF THE AMERICAN FOUNDRYMEN'S ASSOCIATION HELD AT CHICAGO, MAY 4 TO 7, 1931.

SINCE the introduction of fixed carbon fuel several years ago, the cupola melting of bronze metals has been coming to the front. The brass foundry with which the writer is connected has been melting bronze in a special cupola for the past two and one-half years. This short paper on the subject does not pretend to bring out any new ideas but is intended to set forth briefly our experience and practice with this form of melting.

Fuel

Fixed carbon fuel is a form of pitch coke produced by the Barrett Company, and is used in cupolas under license arrangement. The fuel runs 98 per cent and better in fixed carbon and is very low in sulphur and ash, making it an ideal fuel for non-ferrous cupola operation.

Cupola and Operation

The cupola referred to in this paper is of small diameter, 35½ in., shell-lined down to 22½ in. It is operated on low blast pressure and low air volume, using fixed carbon fuel. The metal and coke charges are weighed on a scale situated on the floor level near the cupola, and are elevated and dumped into the cupola by a mechanical charging arrangement having a skip hoist and operated from the floor level.

The molten metal is tapped into a 180-lb. crucible hung on a trolley from an overhead monorail. This monorail connects with pouring cranes which serve all molding floors, and molten metal is taken from cupola to molds direct without transfer.

A platform is located on the charging door level. The operator ascends this platform occasionally to observe the progress of melting or to poke down the charge. Poking down the charge is necessary only when long gates or other bulky materials are used in the charge.

The cupola air blast system is equipped with a volume meter and pressure gage. The slag hole is located on the side of the cupola and the charging apparatus in the rear.

The section of the cupola from the bottom door to a foot or two above the melting zone is lined with a 2-inch monolithic silicon-carbide refractory back by a coarse of firebrick and a coarse of Sil-o-cel brick for insulation. Above the melting zone, ordinary fireback is used for lining.

Lining and Patching

For the monolithic lining, from 400 to 550 lbs. of silicon-carbide cement is required. This lining is good for three weeks or more, depending on the tonnage melted and the care taken in daily patching. The life of the firebrick and insulating brick backing is approximately one year.

The daily patching is done in the morning and requires one hour of labor. The bad spots in the lining are patched with silicon-carbide cement, requiring as a rule from 20 to 40 lbs. After the tap hole and breast are fixed up, the bottom door is swung into place and secured.

The bottom door is permanently lined with firebrick. The space between the wall of the cupola and the firebrick of the bottom door is partially filled with molding sand and then a mixture of fireclay and ground firebrick. This is done through an opening in the back of the cupola. This opening is then closed from the outside by two cupola blocks.

Lighting the Bed

The bed charge of coke is ignited and brought to incandescence by natural draft through the open tuyeres. The blast is put on a few minutes before the first metal is charged. Approximately twenty minutes later, the metal is ready to tap.

Alloys Melted

Two alloys are generally melted in this cupola, either the 85-5-5-5 or the 80-10-10 alloy, or both. When changing from one alloy to the other, all the metal in the cupola is melted and drained out before the second alloy is charged. We try, of course, to run on one alloy as long as foundry conditions will permit.

Charges

The metal charges usually consist of alloy ingots, returned scrap and sprue and returned borings. The metal charge varies with the class of castings made. When light castings are being produced on which there is considerable machining, the amount of borings returned and the amount of sprue are greater, and the proportion of these items used is higher.

Losses

When melting the 85-5-5-5 alloy, the principal loss is in zinc, with practically no loss in copper, lead and tin. The metal is brought to proper composition by the addition of from 1.50 to 2.50 per cent zinc to the crucible.

When melting the 80-10-10 alloy, the main loss is in lead, with a slight loss in tin and practically no loss in copper. The 80-10-10 alloy is brought to proper analysis by the addition of 1.00 to 2.00 per cent lead. The loss varies with the temperature of the metal and the length of time it is held in the cupola. An extremely hot metal held in the cupola for too long a time will show a higher loss than a medium temperature metal that is tapped promptly.

The loss of zinc and lead is apparently by volatilization rather than by oxidation. Our experience is that loss in melting is considerably less in the cupola than in open-flame furnaces.

Size of Charges

A metal charge of 550 lbs. is used and the cupola holds from two to three charges, depending on the bulkiness of the materials used. The bed charge consists of 200 lbs. coke, and the average weight of coke between charges is 34 lbs.

The amount of coke is decreased or increased according to temperature of metal desired. The cupola will melt about ten tons per day and is operated by two men —the cupola tender and the man making up the charges.

Pouring Temperature

A large percentage of the castings produced consists of carburetor castings and bushings. Some of the carburetor castings are very light and are poured at a temperature as high as 2,300 degs. Fahr.

The cupola takes the place of oil and gas-fired crucible and open-flame furnaces formerly used. A few of the crucible and open-flame furnaces still are in use for melting aluminum, manganese bronze and other alloys, the demand for which is comparatively light and in small quantities at any time.

Advantages of Cupola Melting

Some of the advantages of cupola melting are:

(a) Rapid and economical melting.
(b) Ease and ability to get hot metal.
(c) Absence of heat and noise.
(e) Absence of fumes (except when tapping).
(f) Low melting loss.
(g) High quality of product and clean, solid metal.
(h) Ability to melt efficiently borings, turnings, spillings, skimmings, washings, insulated copper wire, etc.

The cupola is not recommended for melting alloys high in zinc content.

Brass Foundries to Establish Correct Cost Methods

By WILLIAM E. PAULSON

Thomas Paulson and Son, Inc., Brass Founders, Brooklyn, N. Y.

ADVERSE conditions are affecting the brass foundry industry as is to be expected. The metal trades generally have been hard hit by the depression in business. For that reason the officers of the Metropolitan Brass Founders Association, having in mind the welfare of their craft, met early in June for a general discussion of their affairs.

A survey of the situation revealed the facts, which might be well called obvious. The New York City area, exclusive of New Jersey, includes upwards of seventy establishments devoted to the production of brass, bronze and aluminum castings. In addition to the local shops there are numerous foundries in Connecticut and Pennsylvania seeking New York local business. Buyers sense these facts, and are of course, taking full advantage of them. They argue for low prices and point to the low metal quotations.

Accurate determinations of foundry costs are unfortunately not the rule, and work is taken at prices that do not pay the necessary charges of running a casting business.

Profits for industry are probably out of the question for business as constituted at present, but it cannot be denied that actual production costs are higher than ever due to decreased volume.

A meeting of the Metropolitan Brass Founders Association was called on June 10th, as a result of these observations and it was there decided to establish a department devoted to assisting foundrymen in determining their individual cost of operations to the end that the industry as a whole be kept in a healthy state and to be in a position to carry on when trade revives.

It is the hope of this organization that the foundries doing business in the Metropolitan area will see the possibilities of cooperation, and lend their support, without which the chaotic condition now prevailing will continue.

WILLIAM E. PAULSON
Secretary-Treasurer
of the
Metropolitan
Brass Founders
Association.

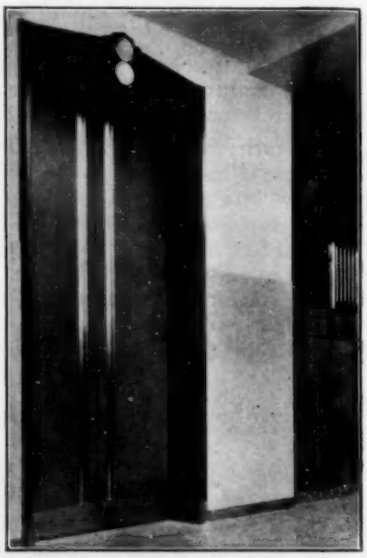
The officers of the Association will be glad to receive inquiries and to give full information on this project to all interested brass foundrymen. William Ember of the Jefferson Brass Foundry, 62 Delavan, Street, Brooklyn, N. Y., is President; F. H. Landolt of the Penn Brass and Bronze Works, 111 Dobbin Street, Brooklyn, N. Y., is Treasurer; William E. Paulson of Thomas Paulson & Son, Inc., 450 Union Street, is Secretary.

Metals in Modern Architectural Decoration

FORMS taken from wooden doors have been abandoned and a frank use made of steel in the doors of the new Irving Trust Company building at One Wall Street, New York. Each door is made of two sheets of steel, one for each side. Vertical channels were crimped in the two sheets, a few inches from each edge, and rolled Allegheny metal moldings were inserted to break the monotony of the flat surfaces. Mopping strips on the doors and the door frames are of the same alloy. The doors are finished in green lacquer and the frames are lacquered in black.

Novel and extensive use of metal was made in the new shoe store of Sommer and Kaufmann, San Francisco, Cal., considered the largest shoe store in the west and probably the most beautiful of its kind in America. A great deal of Monel metal, chromium plate, polished brass, copper and other metals went into the interior decorating scheme.

Left — Cosmetic Room, Fox Theatre, San Francisco. The Walls Are of Mirrors Ornately Decorated Under the Glass. Trim for Doors and Windows, Lamps, and Stand in Lower Left Are of Silver Plated Metal.

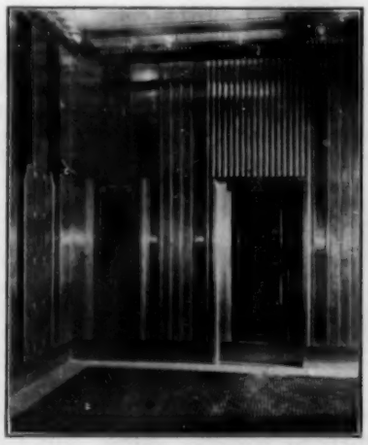


Right — Elevator Doors of Green Lacquered Steel and Allegheny Metal Trim in New Irving Trust Company Building, New York.

Another San Francisco enterprise where metals figure extensively for decorative purposes is the new $5,000,000 Fox Theatre there. Most unusual is a suite of rooms composing the ladies' lounge, cosmetic and smoking rooms. These rooms have mirror walls and silver plated door and window trim throughout. Floor and table lamps used to illuminate the suite are also in silver plate, as well as some of the furniture.

The United States Army has under test a number of duralumin pontoons. These boats are used for supporting temporary bridges for rivers. In recent manoeuvres at the point on the Delaware River where Washington made his famous crossing, the Army found the metal pontoons highly satisfactory.

The possibilities for contrast offered by the new chromium-nickel alloys with materials of darker tone, have been developed in the lobby of the new La Salle-Wacker building, in Chicago, Ill. A marked simplicity has resulted. The walls of the lobby are built up of alternating panels of polished Allegheny metal and dark, steel blue glass. The base, cornice and ceiling in the elevator alcoves are of the same metal. The alternating panels are of No. 18 gauge Allegheny metal and blue glass, held by strips of the same alloy. Doors, display windows and frames of the store doors are of No. 14 gauge Allegheny metal.



Corner of Lobby, La Salle-Wacker Building, Chicago. Walls Paneled with Allegheny Metal and Dark Blue Glass. Ceiling and Cornice of Allegheny Metal.

Photo, Will Connell

Photo, Will Connell

Left—Elevator Lobby, Sommer and Kaufmann Shoe Store, San Francisco. Elevator Doors in Chased Silver Plate; Ceiling Light of Chromium Plated Metal and Glass. Right—Section of Men's Shop with Ceiling of Glass and Copper; Furniture of Metal Tubing Heavily Upholstered.

THE METAL INDUSTRY

With Which Are Incorporated
The Aluminum World, Copper and Brass, The Brass Founder and Finisher, The Electro-Platers' Review

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PALMER H. LANGDON.....Editor and Publisher
ADOLPH BREGMAN.....Managing Editor
THOMAS A. TRUMBOUR.....Business Manager
EVAN J. ROBINSON.....Advertising Manager

Address all correspondence to The Metal Industry, 99 John St., New York. Telephone, BEekman 3—0404. Cable Address Metalustry.

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THE METAL INDUSTRY is regularly indexed in the "Engineering Index" and the "Industrial Arts Index"

Edition this Month, 6,000 Copies. Buyers Guide, Advertising Page 61.

Editorial

A Change of Sentiment

DURING the past month, the business and political world has experienced a change of sentiment and a revival of hopes greater than at any time in the past eighteen months. President Hoover proposed that the nations of the world unite in declaring a moratorium on war debts and reparations, principal interest, for one year. The chief gainer by such an arrangement would, of course, be Germany the greatest loser, the United States. Bad as conditions have been in America, the situation is worse throughout Europe and worst of all in Germany, where an upheaval has become increasingly imminent. It is hoped that a respite will give Germany opportunity to catch her breath and carry on.

The proposal was hailed throughout the United States, almost without exception, as a most statesmanlike move. Abroad, the only country which did not accept immediately was France who submitted a counter proposal as a compromise. At the time of going to press a definite arrangement has not yet been made but it is confidently expected that adjustments will be made, satisfactory to France as well as to other nations.

The effect of the proposal upon sentiment in the United States was almost electrical. Stocks rose vertically and hopes ran high. Cool-headed observers, however, do not expect to see an immediate upturn in business as the summer doldrums are directly ahead of us. Perhaps all we have is the assurance that a world catastrophe has been averted. Nevertheless the importance of even such effects is enormous. If we can feel that we have reached and passed the "true bottom" of the depression in the United States and abroad, if the sentiment of the public and business is changed from one of fear of the future to hope and confidence in improvement, we have come to the turning point and are ready to step steadily, even if not boldly, forward.

Business improvement, of course, must wait upon improved purchasing by the consuming public. After such a siege as we have had this cannot rise rapidly. Nor do we ask for a boom. What we need is steady improvement with a minimum of fluctuation, based upon consumption for actual needs of which we have many, long neglected. Such a beginning will gather momentum which will carry us toward a normal flow of production which we know now is infinitely preferable to the excitement of high times.

To such steady improvement internationally, the President's proposal has given great impetus. It may not be the last word. Conditions change and no one can predict accurately the situation a year from now. But it is certainly the right word at this time.

Wider Fields for Non-Ferrous Metals

WE are accustomed to think of the great bulk of the metal industries in terms of iron and steel. We are impressed by the enormous tonnages of the ferrous metals turned out. For example in 1929 steel was produced to a total of over 63,000,000 tons with a value of $1,900,000,000 and of pig iron, 47,700,000 tons worth $860,000,000. Their nearest competitor was copper with less than 900,000 tons with a value of $320,000,000. Other non-ferrous metals followed far behind.

But there is another way of comparing these tonnages. The term "steel" covers a wide variety of alloys, from the simple structural steels to the complex mixtures, such as the recently developed nickel-chromium alloys. Each of the non-ferrous metals copper, zinc, tin, lead, aluminum, nickel, antimony, gold, silver and platinum is responsible for only a small amount in comparison. But as a group, their total is surprisingly high. In 1929, they amounted to about $900,000,000 in value—an enormous industry, (gold and silver being counted only for their use in the arts and not for coinage).

It has been pointed out in the past that non-ferrous metals are far behind iron and steel in the economic race. It should be added, however, that as a group they are actually gaining, in proportion, on iron and steel. Perhaps the most striking examples of individual gainers are aluminum and nickel.

To what are such gains due? Primarily the increase in the use of non-ferrous metals has been dictated by the demands made for improved products brought on by the higher standards developed in this country during the past two or three decades. The public has demanded better houses, better automobiles and better communications which have called for better metals to satisfy this demand. Non-ferrous metals lend themselves to an almost unlimited number of combinations in alloy form. For certain uses such as electrical transmission and electrical resistance, non-ferrous metals and alloys are standard. We are now finding alloys to resist high temperatures. For corrosion resistance non-ferrous metals have until recently had little or no resistance from the steels, but the advent of the chromium-nickel steels has injected a sharp element of competition into this field. On the other hand, non-ferrous metals can now be produced with mechanical properties far beyond our early hopes, and these together with their chemical qualities commend them for uses under conditions which formerly were considered too severe. Duralumin, for example, can be made with a tensile strength of 60,000 pounds per square inch; copper with 6 per cent nickel and silicon (Corson alloys), 115,000; nickel with 2½ per cent beryllium, 150,000 pounds; Monel metal, 150,000 pounds; copper-nickel plus 4 per cent aluminum, 175,000 pounds.

Steels, it seems, will always lend themselves to higher physical properties than non-ferrous metals, but the latter are now making serious inroads into the territories formerly barred to them. Even though the development of stainless steels points to the beginning of a counter-offensive, the present tendency certainly seems to be in the direction of the use of non-ferrous metals in an increasing proportion of the total metals consumed.

Chromium Consultants

AT the request of a number of our readers who have had troublesome experiences recently, we reprint below an editorial published in our issue for August, 1930.

It has come to our attention through complaints from our subscribers that some electroplating plants, especially those taking up chromium plating, have been victimized by men claiming to be experts on chromium plating who, on later acquaintance, prove to be either amateurs with insufficient experience or common frauds. They have found the trade "easy picking" because of the widespread interest in chromium and the desire for so many plating shops to get into the business. These would-be consultants have extracted their fees and left the unfortunate shop owners with white elephants on their hands, suffering in some cases considerable financial loss. Naturally enough, although regrettably, it is the small shops that have suffered most, as they have been unable to resist the temptation of seemingly low charges. They have taken up these impostors in order to save the higher fees asked by the more reputable organizations operating legitimately.

We urge our readers strongly, to scrutinize carefully the credentials and recommendations of those who solicit business as plating or chemical experts. There are recognized individuals and firms doing legitimate and honest work, who are thoroughly competent to install plants under full guarantees. It is only with such people that it is safe to do business. It is good economy to pay a higher fee for competent service rather than to hire ne'er-do-wells at any price, no matter how low.

Well-Mannered Advertising

ADVERTISING in the United States has for many years been out of the pioneering stage. Americans do not have to be sold on its value. Certainly the war taught us, if we did not know it before, the value of adequate and properly handled publicity.

In one of his daily messages, Ex-President Coolidge stressed the importance of advertising as a business, citing the pertinent fact that it has gained its important and permanent place by establishing the principle that it must tell the truth.

But, like all other useful instruments, advertising can be abused and mishandled. We are surrounded in the cities on all sides by hideous billboards, glaring lights, garish placards and a thousand and one other devices for attracting our attention. In the country the roads are lined with advertising signs which obscure the scenery and take much of the charm from the holidays in which we attempt to get away from stone and brick. In our newspapers and magazines advertising matter is thrown up to us constantly, thrust before our eyes whether we want it or not. Reading matter is purposely broken off short and carried over to the back pages in order to "pull back" the reader into the advertising. So far the front pages of our daily papers have resisted the attack of advertisers but there may be no telling what the pressure of circumstances will do.

THE METAL INDUSTRY in its own comparatively restricted field continues to uphold its standards in advertising. We believe that advertising like reading matter should stand on its own feet. It should not be an intruder, constantly interrupting the conversation of others to draw attention to itself. It should be legitimate, dignified and well-mannered. In our journal advertising has its place to which it is fully entitled, but that place is not in the reading matter, nor is the place of the reading matter in the advertising section. It is for the reader to decide what he wishes to read and when, and it is for the publisher to provide him with such material.

The policy of THE METAL INDUSTRY is still to keep the advertising and reading matter sections separate. We believe that our readers prefer it and that our advertisers gain in the long run by our adherence to this principle.

Competition with Russia

ALONG with other sensations featured in the daily press we have had presented to us the spectre of a new competitor for American industry, soon to be in a position to swamp us with cheap manufactured articles and to wrest from us our export business by dumping raw materials at any price in order to get control of the markets. Russia, now in the throes of her Five-Year Plan, is the bugbear which we have to fear.

In order to get as clear a vision as possible, it is necessary to eliminate from the discussion all questions of politics and differences of opinion about the relative merits of our form of government and the Soviets'. It is also well to remember that news about Russia is notoriously colored to suit the ends of the parties from whom this news comes. Official Russian statements are always laudatory, and statements from those who oppose the Soviet form of government are conspicuously discouraging about Russia's chances for success in her efforts.

Certain basic facts are, however, too clear to be questioned. Russia has enormous natural resources in her territory (the largest in the world under one government). Worked to its limits, Russia can undoubtedly supply the world with wheat, petroleum, manganese and coal, and perhaps with wood. Of copper, lead and zinc she has little, so far as is known at this time, compared with the United States. Like ourselves, she has no rubber or tin. At the present time she is selling her surplus wheat, wood, manganese and coal in order to buy machinery with which to produce manufactured articles, of which she has such a great need. These "surpluses" are acquired by self-denial, actually eating less and living under poor conditions, investing these savings in equipment which will later produce the products cheaply which she cannot afford to buy now.

The avowed object of the Russian plan is not to acquire markets for their own sake, but to put Russia in a position to raise her standard of living, which is at this time notoriously low. According to statements of individuals, if the Five-Year Plan succeeds and the subsequent programs which are sure to follow also succeed, it is the Russian government's idea, not to enrich itself with new markets and new products, but to improve the lives of the people by reducing hours of labor, at the same time improving their living conditions.

This plan, if authentic, concerns only the Russian people and is certainly within their rights to pursue. If, however, as some fear, Russia is bound for world markets, we cannot see the overwhelming danger portrayed by some of our nervous friends. Our own natural resources are fully as rich as Russia's. Our ability is certainly as great and our experience in using our resources is far greater. We are not unaccustomed to the competition of other countries using cheap labor. We have met it in the past with inventive genius. Is it reasonable to suppose that this genius is no longer efficacious?

If Russia becomes a competitor in our domestic markets, we still have the weapon of the tariff with which to protect ourselves. If she becomes a great competitor in foreign markets, she will simply be adding to the large number we already have to contend with at this time. It is perfectly possible that Russia presents a coming problem—certainly not an impressive present danger—but when, as and if it becomes clearly imminent we are confident that America's ingenuity will find ways and means to safeguard her position.

Correspondence and Discussion

Four-High Brass Mills

To the Editor of THE METAL INDUSTRY:

Our attention has been called to shop problem No. 4070, page 128 in your March issue, wherein it is stated that 4-high mills "as yet have made little headway in the brass and copper mills." We are writing you separately in regard to extending you our help on rolling mill problems like this one, and as an example we submit the following for the present instance.

Four-high mills are in operation in a number of plants of the American Brass Company, Scovill Manufacturing Company, Chase Metal Works, Plume-Atwood Manufacturing Company, Western Cartridge Company, Michigan Copper and Brass Company, Higgins Brass and Manufacturing Company, Dallas Brass and Copper Company, Rome Brass and Copper Company, Harrison Radiator Corporation, Taunton-New Bedford Copper Company, Baltimore Copper Mills, and various other plants. Several brass companies have five such mills or more. Bridgeport Brass Company and several others have very similar mills employing the 4-high principle.

The new mill which you correctly mention as equipped with old type equipment is owned by a company which has already purchased 4-high equipment for another plant and is negotiating for additional equipment of the same kind.

In the short three years that we have solicited apparatus from the non-ferrous mills, there are hardly any plants who have not placed orders with us and of the small number who do not have 4-high equipment (for instance, the nickel silver plants), practically every one has allowed us to conduct a commercial test which gave remarkable results.

There are more advantages in a 4-high mill than listed in your report. One is speed, several of our mills being regularly at work on brass strips at 400 to 600 feet per minute. Another is the percentage of draft, which is increased, in addition to the higher speed. Another is the reduction in number of anneals. One of the mills in Waterbury on running down work, is doing in three passes and one anneal the work on which the older mills take nine passes and seven anneals. There is a considerable power saving, and also some incidental advantages.

We think highly of your publication. Please do not regard the comment as intending to be critical, but only in the light of helping you to the accuracy of your very interesting columns.

UNITED ENGINEERING AND FOUNDRY COMPANY,
Wadsworth Doster, Sales Engineer.

Pittsburgh, Pa.

I find it a little difficult, in view of the many valuable features of the 4-high mills, to put down the facts that influenced my answer to problem No. 4070. The inquirer was apparently seeking the exact position this type of mill occupied in the brass mills of this country, at that time.

Of the hundreds of rolling units producing strip and sheet brass, the percentage of 4-high mills that had been installed did not warrant a statement signifying general acceptance of this type of mill, nor could I treat lightly the fact of the recent installation of the old type mills, or a refinement of that type. I also considered unit installations of this type in different mills embracing a period of less than three years. These were all installed because they meet, adequately, a definite need.

The writer can, perhaps, plead guilty to a careless use of the adjective "little" [headway], but does not feel the article under discussion was inaccurate in the picture it meant to convey. It was a broad view of a condition, a conservatism born of some thirty-four years of active occupation with a traditionally conservative industry which prevented a more detailed treatment of the various installations of the 4-high mills, of which the writer was in a measure aware.

In an article published in the January issue of 1929, the writer testified to his faith in the new mills.

WILLIAM J. PETTIS, Associate Editor.

Modern Electroplating

To the Editor of THE METAL INDUSTRY:

I wish to express my appreciation for your help in making my paper on Modern Electroplating for presentation at the local meeting of the A. I. E. E. on April 29th a success. Your periodical, along with the Brass World, furnished practically all of the advertising matter and literature which I used for showing the progress in the art.

The various advertisers without almost any exception were able to furnish material of interest. I appreciate the help received both from you and them. It meant a lot of work on my part, but the results warranted it all in both the satisfaction received on my part and the appreciation of the listeners.

Dr. O. P. Watts also presented a paper entitled "Chromium Plating—The Electroplate that is Different." We are all proud of Dr. Watts and his contributions to the progress of electroplating. He is a modest man but very clever and full of common sense ideas, as you well know.

Our inspection trip to the Scanlon-Morris Company plant proved very interesting, from the standpoint of inspecting the practical application of nickel and copper plating in a modern plant but also as much from our contact with Mr. Brower, the head plater, who is very clever both in his work and in devising methods of plating of his own. One evidence of his cleverness was a faucet of brass plated with a twenty-minute coating of chromium that was directly applied, and if the finish is any example of what can be done commercially, he certainly has worked his process successfully.

J. G. ZIMMERMAN, Electrical Engineer.

Madison, Wisconsin.

New Book

Tables of Chemical Compositions, Physical and Mechanical Properties and Corrosion Resistant Properties of Corrosion Resistant and Heat Resistant Alloys. Published by the American Society for Testing Materials, Philadelphia. Size 5½ x 9½, paper covered. Price $1.50.

This is a special reprint from the Proceedings, Volume 30, Part 1, 1930, of the American Society for Testing Materials, which consists of a set of tables designated as Plates 5 to 15 covering iron-chromium, iron-chromium-nickel and related alloys as prepared by Committee A-10. They are an especially valuable compilation of information on corrosion resistant and heat resistant alloys. The range of materials also covers special steels, nickel and high nickel alloys, brasses, bronzes and other copper alloys, aluminum alloys, etc.

Government Publications

Government publications are available from the Superintendent of Documents, Government Printing Office, Washington, D. C., to whom proper remittance should be made to cover price where a charge is mentioned. In some cases, as indicated, applications should be made to the governmental body responsible for the publication.

Copper in 1930. Department of Commerce. Statistics on production, consumption, stocks and foreign trade.

Abrasive Grain Sizes. Bureau of Standards, Department of Commerce. Simplified Practice Recommendation R118-30. 5 cents.

Mineral Resources of the United States, 1928. Part I—Metals. Bureau of Mines, Department of Commerce. Size 6x9; 910 pages; cloth. $1.50

Abrasive Grain Sizes. Simplified Practice Recommendation R118-30. Bureau of Standards, Department of Commerce. Issued May 4, 1931, effective since September 1, 1930.

Shop Problems

This Department Will Answer Questions Relating to Shop Practice.

Brightening Castings

Q.—We wish to ask if you can give us an acid mixture for pickling brass castings of 85-5-5-5 metal which will not give us a surface having a plated appearance. In other words, we are anxious to clean and dip our brass castings direct from the mold, leaving a natural copper color to the surface of the metal. For your information, we do not blow our cores in a water tank.

A.—Examination of sample casting showing the outside surface which you desire on your 85-5-5-5% brass fittings indicates that this surface is obtained by water rumbling the castings in a wood-lined tumbling barrel, packed in with a lot of fine slag, care being taken that enough slag and fine metal is used to avoid nicking the castings. A good material to use is your skimmings. It will clean your metal and can be used again. You will be surprised at the metal you will recover.

When the castings are cleaned of all sand and the surface is smooth, then acid dip in the following:

Yellow aqua fortis, 38%	2 gallons
Sulphuric acid, 60%	1 gallon
Water	½ gallon
Common salt	1 ounce

Rinse in cold running water, then rinse in hot water, and then swing the castings until dry.

W. J. R., Problem 5,007.

Casting Brass

Q.—I am sending you a casting which we have trouble in producing. We are using No. 1 yellow brass ingots, the return sprues and gates, with the addition of 4 oz. aluminum. Metal is melted in No. 60 crucibles in coke pit furnaces.

The molding sand is a medium grade. The molds are rammed lightly around the edges and squeezed only enough to prevent the cope from dropping out. The sand is worked as dry as possible. The blotches and small cracks are usually on the drag side of casting, although on the one I am sending it is on both cope and drag.

You will also notice that there are small sand holes on the drag. All loose sand is blown out of the mold. There is apparently a large amount of gas in the metal. Is there any way to eliminate the gas? I would appreciate any information you can give us on the cause and elimination of the above trouble.

A.—On examination of the sample casting submitted we are of the opinion that the crystaline effect is caused by overheating the metal, an excess of zinc in the alloy, and an excess of aluminum.

We suggest that you try adding 10 pounds of copper to your No. 1 brass ingot, and not over 3 ounces of aluminum to the No. 60 crucible.

The sand shown in casting may be caused by a scab in your running gate, and we suggest you open up the sand if you find a scab in your runner. If not, we suggest looking over the core for any loose sand or crushes. At any rate, sand is not in the metal and comes either from the mold or core. You will find, also, that pouring at a lower temperature will help prevent eating in-to the sand. The addition of copper to your metal as suggested will also help overcome your trouble.

W. J. R., Problem 5,008.

Chromium Analysis

Q.—I am shipping you a sample of my chromium solution. Will you please tell me what is wrong with it? The work comes out with bare spots. My plater tells me that I need more chromic acid.

A.—Analysis of chromium solution:

Chromic acid	36.85 oz.
Trivalent chromium	.20 oz.
Sulphates	.34 oz.

Analysis shows that the chromic acid content of the solution is too low. We would suggest that you add 12 ounces of chromic acid to each gallon of solution, and then operate solution at 95° F., and a cathode current density of 50 to 75 amperes per square foot.

O. J. S., Problem 5,009.

Chromium Information

Q.—I stored a chromium solution for a time, and due to a poor roof rain got into the solution. It does not show any reading on the hydrometer now. The tanks were about half full when stored; now they are nearly full. The readings were about 30 on the hydrometer when stored. There was about 435 gallons of it. Please advise if I can do anything with this solution.

I would also like to have the formula for a good "hard" chromium solution, together with directions for operation and maintenance. My original solution was one that I purchased.

A.—We would not advise you to use the old solution or to try to replenish it. We would recommend that you use a steel tank, lead and glass lined, and to make a solution from the following formula:

Chromic acid	55 oz.
Sulphuric acid	0.3 oz. by weight
Water	1 gallon

Operate the solution at 95° F., with cathode current density of 50 to 75 amperes per square foot.

O. J. S., Problem 5,010.

Chromium on Files

Q.—We are interested in chromium plating. Kindly tell us just what we need for chromium plating files after they are sharpened by sand blasting.

For the small tank that we would use, can we use a generator such as is used on an automobile or truck? Please state proper amperage, voltage and temperature.

Could you send us a diagram of the hook-up for a tank 16 in. wide by 36 in. long by 36 in. deep?

A.—For chromium plating such work as files we would recommend the following formula for a chromium solution:

Chromic acid	33 oz.
Sulfuric acid	0.3 oz. by weight
Water	1 gallon

Operate the solution at 113° F., with a cathode current density of 150 amperes per square foot.

The size of the generator necessary will depend upon the amount of work to be placed in the solution. It may be calculated by multiplying the amount of square feet of work surface to be plated by 150. An automobile generator will not do.

The tank should be made of iron, lead and glass lined; 6% antimony lead anodes should be used.

Plate as follows: After sand blasting, pickle in a 5% hydrofluoric acid solution to dissolve any small parts of silica which may be left on the files from sandblasting; rinse thoroughly in clean cold water; next use a concentrated sulfuric acid pickle, which is used in either a lead lined or earthenware tank with lead cathodes and 6 volts pressure; the work is left in this pickle for 15 to 30 seconds, then rinsed in clean cold water, and then placed in the chromium solution.

The hook-up for a chromium plating tank is the same as for other plating tanks; the anode and cathode rods should be insulated from the tank.

O. J. S., Problem 5,011.

Fluidity of Solder

Q.—I have a solder bath with a mixture of 55 lead and 45 tin, and wish to add bismuth to promote fluidity. What quantity is required to get results Please give method of adding bismuth.

A.—The lowest melting solder consists of 44 tin and 56 lead, which melts at 345° F. The addition of 1% bismuth may possibly increase the fluidity. However, we have found that if the metal is kept clean with the above mixture the maximum fluidity and lowest melting point is obtained.

We have, however, the following list, of flusible alloys we have made with tin, lead and bismuth:

Tin	Lead	Bismuth	Melting Point in Degrees F.
3	4	2	300
4	4	1	320
3	3	1	310
1	1	1	254
2	1	5	199
3	1	5	210

Zinc perhaps, is the greatest enemy of solder. One ounce in 1,000 pounds will make the seams rough, small lumps appearing. It will blacken the tinning upon the soldering iron and the solder will refuse to flow. One pound of zinc in 1,000 pounds of solder makes it unfit for use. Zinc, however, is easily removed from solder.

Antimony in quantities not over 1% does not injure solder. We recommend using new metal in making solder when fluidity is desired. The addition of bismuth to impure metal will not correct impurities.

W. J. R., Problem 5,012.

Oxidized Bronze

Q.—Please supply us with a formula for bronze plating; also, a chocolate color for bronze and copper sheet metal caskets.

We have tried several oxidizes, after plating the work with cyanide copper, but always have had unsatisfactory results; either the oxidize comes off or it shows spots here and there, and light or dark patches that are very noticeable.

Will you please give us a formula to overcome this so that we can have a uniform color on large and flat surfaces?

A.—The following formula will produce a good bronze color:

Copper cyanide	4 oz.
Zinc cyanide	½ oz.
Sodium cyanide	5 oz.
Carbonate soda	2 oz.
Rochelle salts	2 oz.
Water	1 gallon

Temperature 95° F.; cathode current density 2 to 2.5 amperes per square foot; use rolled bronze anodes of 90% copper, 10% zinc.

The following formula for an oxidizing solution will work well:

Sodium sulphide	1 oz.
Barium sulphide	1 oz.
Water	1 gallon

Use this solution at 100° F., and if the work is too large to immerse, use a brush or sponge to oxidize the surface. After the oxidizing operation, use a brush or flat piece of felt with flour pumice to even the finish.

O. J. S., Problem 5,013.

Reclaiming Zinc Dross

Q.—What equipment is necessary, and where can this be obtained, for smelting and refining zinc dross taken from galvanizing kettles?

Also, could this be done within a building, or would it be compulsory to erect the smelter out in the open, and how much would the cost be?

A.—The equipment necessary for smelting and refining of zinc dross consists of a bottle-shaped retort and a condenser. The smelting furnace usually consists of eight of these bottle-shaped retorts grouped around a central stack, or chimney. The furnace is so constructed that the bottom of the retort is the hottest part, and it is necessary to keep this part of the retort hot so that the residues and impurities, mostly iron, will not freeze to the sides. This material is removed from the sides with difficulty, and in many instances the retort must be sacrificed to get it out.

The retorts are made of graphite with a clay binder. They are 35½" in length, 8¼" in diameter at the neck, 20" in diameter at bilge, and 14" in diameter at the bottom. Each retort will hold approximately 750 lbs. of dross, but a charge of 700 lbs. is worked most conveniently. The metal is distilled in 18 hours and the yield varies from 75% to 88%. The metal obtained will average about 99.90% to 99.98% pure. The furnace is operated by three men in three shifts of 8 hours each.

The furnace may be fired with soft coal, coke, or natural gas. The smelting is usually done in an open building; that is, one in which the doors and windows may be opened freely, and which is some distance away from the business or industrial section of town. Considerable fumes may come from the retorts, and it is best to have the plant located some distance out so that it will not annoy anyone.

It is difficult to say just what the actual cost of one of these smelters would be as that depends upon many local factors. The building, pots, furnace for smelting, and all necessary tools, equipment, etc., will come to $10,000 or more. The crucibles and other equipment can be obtained from graphite crucible manufacturers. (See "Buyers' Guide" section.)

W. G. I., Problem 5,014.

Tinning Lead Blanks

Q.—We are sending under separate cover two samples of tin and lead blanks. We would be pleased to know by what process we could coat the lead blanks with a coat of tin similar to that of the tin blanks.

A.—The lead blanks may be tin plated in a solution made from the following formula:

Sodium stannate	12 oz.
Sodium acetate	2 oz.
Caustic soda	2 oz.
Water	1 gallon

Temperature 120° F.; 5 to 10 amperes per square foot.

We presume from the nature of your business that what you have in mind is to place a deposit of tin on the lead blanks, and then extrude them into tubes covered with tin. Whether you will be able to deposit the tin in sufficient thickness to get a deposit that is adhesive enough for this purpose only experimenting will tell.

O. J. S., Problem 5,015.

Patents

A Review of Current Patents of Interest

Printed copies of patents can be obtained for 10 cents each from the Commissioner of Patents, Washington, D. C.

1,798,607. March 31, 1931. **Method of Detinning.** Emanuel Kardos, San Francisco, Calif.

In detinning material containing metallic tin, the process which comprises dissolving the tin in a solution of caustic alkali containing reaction products of vitrous gases with said alkali.

1,799,116. March 31, 1931. **Electrolytic Apparatus.** Jacob Emil Noeggerath, Berlin, Germany.

Apparatus for the electrolytic decomposition of water or other liquids and solutions under high pressure, comprising a vessel and a plurality of electrodes of different polarity arranged in said vessel substantially in parallel to each other and being connected in series, positive and negative electrodes alternating with each other and connected together to form a self-contained body altogether surrounded by the electrolyte, and conduits connecting the electrolyte outside of said electrode body with the electrolyte in the respective cell sections of said body.

18,030. (Re-Issue). April 7, 1931. **Method of Applying Protective Layers on Metals or Other Electric Conductors.** Jonas Hjalmar Mellquist, Stockholm, Sweden.

Electrogalvanic method of applying a protective layer of high oxidation potential on electric conductors especially metals, consisting in using said conductors as an anode in an alkaline solution of a hydroxy carboxylic acid salt of a metal adapted to form peroxides.

1,799,157. April 7, 1931. **Manufacture of Metallic Powders.** Eugène Drouilly, Paris, France, assignor to Société Anonyme Trefileries & Laminoirs du Havre, Anciens Etablissements Lazare Weiller, Société Coopérative de Rugles et la Canalisation Électrique Réunis, Paris, France.

In the electrolysis of metallic salt electrolytes to obtain metallic powders, the step which comprises electrolyzing a solution of a metallic salt containing the carbonaceous reaction product of glucose and sulphuric acid substantially in colloidal dispersion.

1,799,837. April 7, 1931. **Aluminum Base Alloy and Piston Made Therefrom.** Robert S. Archer, Lakewood, and Louis W. Kempf, Cleveland, Ohio, assignors to Aluminum Company of America, Pittsburgh, Pa.

An aluminum base alloy containing from about 7 to 15 per cent of silicon, from about 0.2 to 3 per cent of magnesium, from about 0.5 to 7 per cent of nickel and from about 0.3 to 4 per cent of copper.

1,799,851. April 7, 1931. **Chromium Plating by Electrolytic Deposition.** Auguste Hollard, Paris, France, assignor to Société Nouvelle de l'Orfèvrerie d'Ercuis, Paris, France.

A bath for chromium plating conductive bodies by electrolytic deposition comprising sodium bichromate, 25 kilograms; chromic acid, 15 kilograms; and chromium fluoborate, 900 grams.

1,800,983. April 14, 1931. **Method of Casting Molten Metal.** John G. Collins and William J. Reardon, Detroit, Mich., assignors to National Alloys Co., a Corporation of Michigan.

A mold having a mold cavity communicating through a constricted passage with a settling cavity at its base and having a sprue communicating with said settling cavity; and core supporting members positioned at opposite ends of said mold cavity.

1,801,629. April 21, 1931. **Electroplating Magnesium and Alloys Thereof.** Ivan A. Kenaga, Midland, Mich., assignor to The Dow Chemical Company, Midland, Mich.

A method of plating articles composed of magnesium or a magnesium base alloy, which comprises electro-depositing thereon zinc from a solution of a zinc halide in a substantially anhydrous alcoholic medium.

1,801,808. April 21, 1931. **Process for Covering Metals or Alloys With Layers of Metallic Beryllium.** Hellmut Fischer, Berlin-Friedenau, Germany, assignor, by mesne assignments, to Metal & Thermit Corporation, New York, N. Y., a Corporation of New Jersey.

The process of producing a permanently adhering coating of a beryllium alloy upon a metal article having a surface which readily alloys with beryllium, which consists in preparing a melt of a sodium fluoride and beryllium fluoride kept liquid by the application of heat, immersing in said melt the article to be coated, connected as the cathode, and electrolyzing said melt with the aid of an insoluble anode while maintaining the melt at a temperature which lies below the fusing point of beryllium and slightly below the fusing point of the said article.

1,802,265. April 21, 1931. **Method of Improving Magnesium Alloys.** Heinz Menking, Bitterfeld, Germany, assignor to I. G. Farbenindustrie Aktiengesellschaft, Frankfort-on-the-Main, Germany.

The method of refining the crystalline structure of magnesium alloys which comprises melting the alloys and temporarily subjecting the molten alloys to temperatures of about 200° C. and more above their melting point.

1,802,463. April 28, 1931. **Process of Producing Chromium-Plated Articles with Mirrorlike, Scratch-Finish, or the Like Surfaces.** Colin G. Fink, New York, N. Y., assignor to Chemical Treatment Company, Inc., New York.

The process of producing a chromium plate surface of a desired ornamental appearance upon an article having a metal or alloy surface which does not have formed thereon an insoluble precipitate when in contact with a chromic acid plating bath, said process comprising preparing said metal or alloy surface, prior to chromium plating, so that it has the ornamental appearance desired for the finished surface, then electroplating the same with chromium in a bath prepared and maintained in the proportion of 500 grams of chromic acid (CrO_3) per liter and from 2 to 8 grams of sulphate (SO_4) per liter or an amount of other acid radical equivalent in effect (the optimum being 5 grams of sulphate (SO_4) per liter for a bath containing 500 grams of chromic acid (CrO_3) per liter) and a proportionately lower or higher sulphate (SO_4) content for a lower or higher chromic acid (CrO_3) content, while substantially maintaining for a given temperature the cathode current density range delineated by the line X on the accompanying graph.

1,802,695. April 28, 1931. **Bimetallic Protective Coating for Iron Tubes.** Irving T. Bennett, Brooklyn, N. Y., assignor, by mesne assignments, to Metropolitan Engineering Company, a Corporation of New York.

A water tube for boilers provided with a fin to be exposed to the fire, said fin being of ferrous metal and having a surface alloyed with a coating of chromium and an outermost coating of nickel alloyed with said chromium.

1,802,693. April 28, 1931. **Process of Treating Metals with Nitrogen.** Robert J. Anderson, Fairmont, W. Va., assignor to Fairmont Manufacturing Company, Fairmont, W. Va.

The process which comprises removing a solid impurity from a metal by the intermingling of nitrogen therewith until the solid impurities are substantially entirely removed.

1,804,054. May 5, 1931. **Method of Treating Materials Containing Lead.** Carle R. Hayward, Quincy, Mass.

A method of treating lead containing an oxide or oxides of lead, arsenic, tin or antimony, comprising the step of heating the same above the melting point in the presence of a reducing agent and a flux containing stable oxygen salts of an alkali metal and a fluoride.

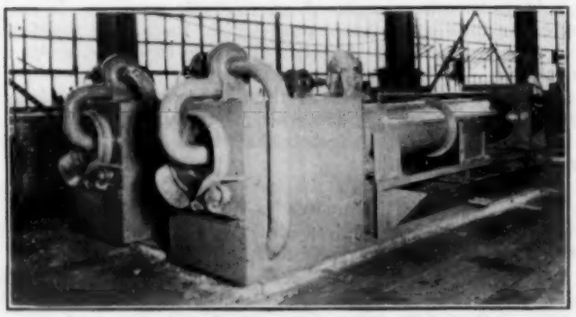
Equipment

New and Useful Devices, Metals, Machinery and Supplies

Metal Cleaning Equipment

Before the war cartridge cases and clips were washed, rinsed and dried in the Frankford Arsenal at Philadelphia, Pa., by a series of separate operations involving a great deal of hand labor. Tanks and small barrels were employed, the batches being transferred from one barrel to another by the help of small hoists. War naturally stepped up production schedules and faster methods, requiring fewer men, were sought. At that time an "Ideal" continuous cleaning machine was installed and this equipment was adopted by other arms plants.

The Frankford Arsenal has just installed some more modern



Ransohoff Cleaning Equipment at Frankford Arsenal

equipment in the shape of the two continuous cleaning assemblies designed and built by N. Ransohoff, Inc., Cincinnati, Ohio, who made the war time installation referred to above. The two machines are identical in design.

Into the hopper at the far end of the machine shown in the illustration an entire batch, consisting of 4.8 cu. ft. of parts, is dumped. The drum is so arranged that it takes the work from the hopper and feeds it at correct speed to insure proper cleaning. In the first compartment a spray of cleaning compound plays on the work, effecting a thorough wash. As the work passes through the second chamber it is rinsed, and in the third chamber it is dried by air drawn over steam coils and blown directly onto it.

So positive is the drum action which controls the rate of speed at which the work travels that a thorough wash is achieved, yet the work is not crushed nor marred by the operation, the maker claims.

New Copper Rod Mill

Announcement is made that the Eugene F. Phillips Electrical Works, Ltd., Brockville, Ontario, have awarded a contract for a new copper rod rolling mill to be built jointly by the Farrel-Birmingham Company, Ansonia, Connecticut, and the Dominion Engineering Works, Ltd., Montreal, Canada. This rod mill is of the Belgian type with latest automatic and semi-automatic handling devices.

Three years ago the Farrel-Birmingham Company developed and built a complete roller bearing mill of this type which was a marked advance in rolling of copper rods, effecting large savings in labor, power, maintenance and general operating costs, that company states. The Phillips mill is being designed along similar lines. The mill is designed to produce 15 tons of ¼" round rod per hour in 14 passes from standard wire bar, and it will be the fastest mill of its type ever built, having a finishing speed of 1,650 feet per minute, it is stated. The mill is designed to roll also a large number of other shapes, which makes it a desirable unit for plants manufacturing electrical supplies.

Free Bending Sheet Zinc

A new type of sheet zinc of superior bending properties is now being furnished by The New Jersey Zinc Company, 160 Front Street, New York City, under the trade name "High Grade Sheet Zinc." According to the announcement by the company, it is an ideal metal for jobs where the sheet metal worker wants the well known qualities of zinc plus all the advantages of metal which can be bent, seamed and formed, both with the grain and across the grain, without fear of cracking. This sheet is expected to supply the demand for greater workability in sheet zinc.

Another desirable quality of the new sheet is its exceptionally smooth surface—the result of special rolling of special metal, the maker states. It is recommended for roofing, cornices, gutters, flashings and other formed articles involving intricate bending and seaming. The sheet is being supplied in all the commercial gauges and sizes, either flat in boxes or rolled in casks. The new product carries no price premium over the regular commercial grades.

New Ceramic Materials

General Ceramics Company, 71 West 35th Street, New York City, announces the introducton of two new products, "Ceramit," a new ceramic material, new type of acid-proof brick.

"Ceramit" is stated by the makers to be a ceramic material of maximum density, the absorption coefficient being about 0.01%, which is approximately that of porcelain. Its advantage is that it can

"Ceramit" Tank for Electroplating and Other Processes

be formed into shapes of wide variety, mechanical strength being high and resistance to changes in temperature being not less than ordinary stoneware. An important application of "Ceramit" is said to be in tanks for electrolytic refining of precious metals. Other uses are for tanks for separation of precious metals; and equipment used in electrical and electrochemical processes, including copper plating. "Ceramit" is not affected by any chemical except hydrofluoric acid, it is stated.

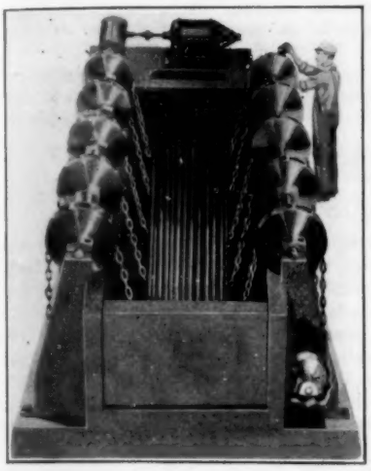
The new acid-proof brick offered by General Ceramics is a dense, strong vitrified product all the way through, with smooth, attractive acid-proof glaze on the exposed side, according to the manufacturer. Superior quality and accurate shape are stressed.

Zapon Consolidates Offices

The Zappen company, Stamford, Conn., manufacturing chemists, well-known lacquer producer, announces that its New England sales division headquarters has been removed, effective June 15, from New Haven to Stamford, where all communications for the New England division should now be addressed. The New Haven office was established when the company's executive offices were in New York. Now the company's general headquarters as well as its plant are at Stamford, and it is believed that removal of the New England division headquarters to that city will greatly facilitate service to customers, saving at least a day in delivery of orders. John C. Oberender continues in charge of the New England division.

Pickling Equipment

Bronze Die Casting Company, Franklin Street at Ohio River, Pittsburgh, Pa., has placed on the market a tumbling pickler for metals which is said to speed up pickling operations considerably, cutting time on some operations from one or 1½ hours down to 15 or 20 minutes, according to the manufacturer. The equipment consists of a reinforced concrete or wood tank and "Albro Metal" machinery. The moving parts consist of motor-driven shafts and conveyor apparatus which carry the work through the pickling solution. Work is constantly turned in the solution. No sprocket wheels are used. The "Albro Metal" parts are stated to be complete acid-proof, eliminating possibility of damage by corrosion. Work such as bars or pipe can be run over the conveyor in bulk; small work is carried through in perforated barrels. Considerable reduction in pickling costs are said to be effected by the use of this equipment. Complete information is available on request from the manufacturer.



New Tumbling Pickler

Analysis Service for Platers

A complete chemical analysis service for electroplaters and finishers is offered by the Textor Chemical Laboratories, analytical chemists, 1167 West Sixth Street, Cleveland, Ohio. This laboratory states that its service consists of the following:

Analysis of all kinds of plating solutions (at regular intervals), and analysis of buffing compounds, cleaners, lacquers, etc. Furnishing necessary containers for all samples of solutions; also instructions for utilizing the service to the best advantage. Sending reports of analysis of solutions usually on the same day samples are received. Giving recommendations for bringing solutions to the desired formulas, or to formulas generally employed. Furnishing questionnaire covering the full plating operation in cases where analysis alone does not disclose cause of difficulty. Occasionally, when client still fails to produce satisfactory plate, the laboratory requests two gallons of plating solution, which is tested thoroughly for the influence of temperature, current density, racking, and other factors which influence the plating operation, making the tests under actual plating conditions.

New Aluminum Alloy

Ruselite Corporation, 1015 North 4th Street, Milwaukee, Wis., has placed on the market a new aluminum alloy known as "Ruselite." The alloy is composed of 94% aluminum and the balance copper, chromium and molybdenum. It is stated to be suitable for sand or die casting, hard rolling and annealing, heat treating, etc. Physical properties mentioned by the producer include tensile strength of 30,000 lb. per sq. in. when die cast, with elongation of 6% in 2 in.; tensile strength of 40,000 to 42,000 lb. per sq. in. when rolled; elongation 2% when hard rolled, 20% when annealed; tensile strength of up to 60,000 lb. when heat treated.

The metal is said to polish to a high lustre resembling chromium plate, and to retain it for a considerable time. It is recommended for refrigerator and other hardware where strength, ductility and finish are important. "Ruselite" is available in ingots for sand or die casting. Arrangements are being made for supplying it in sheets also.

Ruselite Corporation has also developed a series of other alloys in which they have combined such high-melting-point metals as tantalum, molybdenum and chromium with such low-melting-point metals as copper, aluminum and zinc. These alloys include one containing zinc, copper, chromium, molybdenum and tantalum, a chromium brass, a tantalum bronze, a chromium-zinc-aluminum alloy.

Black Coloring of Cadmium

The Udylite Process Company, 3220 Bellevue Avenue, Detroit, Michigan, licensor of the "Udylite" process of cadmium plating, announces a new finish, "Udyblack." This new finish is stated to be particularly adaptable to articles of ornamental iron and to cast and sand-blast surfaces. It will produce either a jet black or a steel gray against a highlighted bright "Udylite," depending on the method of relieving. The coating consists of a black powder which can easily be wiped off. Underneath the powder there is a thin, steel gray coating which adheres very well to the "Udylite" coating, the company states. As the coating does not accelerate the corrosion of "Udylite," the combination coating possesses at least the rust proof qualities of "Udylite," it is stated.

Aluminum Solder

Exeter Brass Works, Exeter, N. H., has placed on the market a solder which they claim can be used on aluminum with an ordinary soldering iron. The company states that tests have been made in its foundry by soldering handles on the ends of pattern plates. Results are stated to be uniformly good, indicating that the soft solder can be applied generally to aluminum. It is also claimed that the solder has been found successful on aluminum die castings. The soft solder is used without acid or flux.

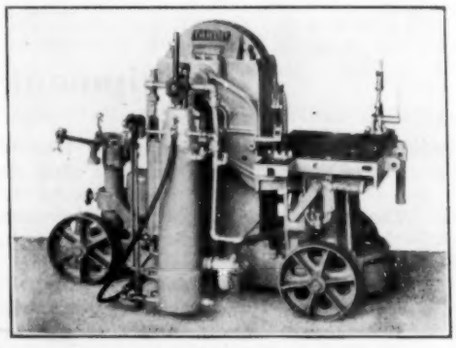
The company also produces a solder for joining aluminum with the blow torch. This is also used without flux and is said to give a joint stronger than the alloys joined.

Samples of either type of solder may be had on request to the manufacturer.

Molding Machine

The Tabor Manufacturing Company, 6225 Tacony Street, Philadelphia, Pa., has placed on the market a new piece of foundry equipment known as the Tabor "Jar, Rollover and Pattern Draw Molding Machine." The makers state that the machine has an effective long-stroke jarring blow and requires a minimum of time for ramming of molds; that the mechanism is oil controlled, making it safe to operate at high speed. The machine will roll over in 4 seconds, it is stated. Other characteristics are given by the maker as follows:

Table is free of the rollover frame during jarring operation, but is locked securely to it when machine is rolling over; this locking is automatic and positive; levelling mechanism is entirely automatic, levelling flasks instantly when levelling device contacts bottom board of flask; operator is not required to touch the levelling member, which is controlled from valve stand; pattern draw also oil controlled, giving slow start and steady draw; pattern draw guide is self-aligning and ball-bearing, is oilless and requires no lubricant; machine is fully enclosed and protected from sand; table size, 18 x 28 in.; draw, 10 in.; jar cylinder, 4½ in. dia.; rollover cylinder, 7 in. dia.; capacity, 350 lb. with 80 lb. pressure.



New Tabor Molding Machine

New Plating Consultant

Fred J. ("Dad") Liscomb, formerly with the Hanson-Van Winkle-Munning Company, Matawan, N. J., has opened an electrochemical laboratory for the benefit of manufacturers who do electroplating but have no chemist or laboratory of their own. The laboratory is located at 6066 Nickerson Avenue, Chicago, Ill. Specialties of the new firm are analysis of plating solutions; perfecting of methods and cycles for cleaning, pickling, and plating; locating faults in equipment, solutions or processes.

Conveying Equipment

A new type of handling equipment, known as the Mathews "Ball Transfer," is designed to accommodate the movement of any object having smooth hard surfaces in any direction on a horizontal plane. Its application is not confined to any particular type of work or to any one industry. This device is made up with a large hardened steel ball which rotates on a series of smaller balls held in a cupped base. Two models are available, one for mounting in series on a table of flat surface support, and one for mounting on pipe supports. When mounted in groups the "Transfers" provide an effective means of moving heavy shapes to and from shears, for conveying boxes to and from a line of roller or power conveyor, for handling heavy cores or molds when these loads are placed on smooth bottom plates, it is stated. The ball table, as it might be termed when a group of the ball transfers are used, also serves as an efficient turntable for rotating heavy work in machining operations. When mounted on pipe supports fixed in the floor in any desired arrangement, these transfers provide a bed on which large plates and other materials of this sort can be moved.

The Mathews "Ball Transfer" was designed and is constructed by Mathews Conveyor Company, Ellwood City, Pa. A new folder which illustrates and describes this equipment will be sent to readers by the manufacturer on request.

Monel Kitchen Sinks

The kitchen has succumed to the modern influence. A new type of kitchen sink made of solid Monel metal has been placed on the market in a series of standardized models, by the International Nickel Company, New York.

A distinctive feature of the sink is its one-piece construction, achieved by stamping from sheet metal on huge presses used in manufacture of automobile bodies. It has flowing curves at all corners that eliminate cracks and crevices in which dirt could accumulate. It is made of 16 U. S. standard gauge metal, reinforced with metal braces, and sound deadened.

Another construction feature of the Monel metal sink is its saving of space over those of the older type. The diameter of the roll edges is half an inch, which is said to result in 31% increased working drainboard as compared with other types of sinks. It has a silvery satin finish that harmonizes with any bright color scheme. Monel metal is proof against rust and resistant to all ordinary forms of corrosion, has no coating to chip, is unaffected by heat or cold, has a hard, close grained surface which cannot be dented easily and on which household abrasive cleaners can be used without harm.

Standard equipment includes a solid nickel-silver combination crumb-cup, strainer and stopper. A solid nickel-silver faucet with single swing spout is available with a satin finish to match the Monel metal sink.

Screening Machinery

Great Western Manufacturing Company, Leavenworth, Kansas, manufactures a variety of screens for industrial use. These screens are stated to be suitable for screening scrap metals, metallic ashes and similar material. The company states that its product is highly efficient, operating with a minimum power. The screening machines are made in both dust-proof and open types, and in a variety of sizes. Particles are not scraped horizontally but vibrated vertically in these machines, according to the manufacturer. This is said to reduce abrasion of the material and loss from dust, etc. It is also said to keep the mesh open when material difficult to screen is being treated. Special machines are built for particular types of work.

Electric Furnace Lining

Laclede-Christy Clay Products Company, St. Louis, Mo., has placed on the market "Furnaseal C-8 (Super-Ram)," a material for lining or patching electric furnaces for high temperature metal melting. Monolithic linings can be produced from the new material, as well as patches which become homogeneous with the lining. The makers stress its high slag resisting qualities. The possibility of producing a one-piece lining for the high temperature electric furnace is said to contribute considerably to its efficiency and long life. Maintenance cost is said to be reduced to minimum. The material is stated to ram very hard, due to its high tensile strength when rammed; to burn very hard; and to withstand abrasion remarkably well. It is also very resistant to corrosion by slag. It is especially recommended for furnaces used for melting nickel and copper alloys. Wide industrial use is already being made of the material, according to the manufacturer.

Equipment and Supply Catalogs

Sling Chains. Newhall Chain Forge and Iron Company, 9 Park Place, New York City. Circular on sling chains and parts.

Grinding Wheels. Norton Company, Worcester, Mass. "Factors Affecting Grinding Wheel Selection," a 15-page booklet of technical data.

X-Ray Service. Claud S. Gordon Company, 708 West Madison Street, Chicago, Ill. Circular on industrial metallurgical x-ray service.

Aluminum Welding. Aluminum Company of America, Pittsburgh, Pa. A wall card giving instructions for torch, metallic arc and carbon arc welding of aluminum.

Machinery. Giddings and Lewis Machine Tool Company, Fond du Lac, Wis., and The Watson-Stillman Company, Roselle, N. J. Boring mills; hydraulic machinery. Circular.

Aluminum Alloy Castings. The British Aluminum Company, Ltd., 122 East 42nd Street, New York City. Second edition of a good booklet on casting aluminum alloys. Fully illustrated, it contains considerable valuable information.

Electric Furnaces and Kilns. Duncan Mackenzie's Sons Company, Inc., Trenton, N. J. Looseleaf illustrated bulletin on "MacMar" equipment for heat treating metals, assaying, metallurgical analysis, etc.

Silver Brazing of Monel Metal and Nickel. The International Nickel Company, Inc., 67 Wall Street, New York City. Article by this title appears in "Inco" magazine, published by this company.

Ingot Metals. The Tottenville Copper Company, Inc., Tottenville, Staten Island, N. Y. A list of standard formula ingots, description of their chemical and physical properties, application, etc., and other data on non-ferrous ingot metals.

Recording Thermometers. The Foxboro Company, Foxboro, Mass. Complete description of units composing a recording thermometer; data on vapor tension and gas filled thermometers; engineering data on bulbs, sockets, helical tubes, instrument boards.

Centennial Booklet. Philadelphia Quartz Company, 121 South Third Street, Philadelphia, Pa. Charming booklet giving the history of the company founded by Joseph Elkinton 100 years ago. It is illustrated with reproductions of old signs and advertisements, pictures of original buildings, old bills and checks, etc.

Conversion Tables. W. S. Rockwell Company, 50 Church Street, New York City. Conversion table of constants of heat transmission and conduction; Centigrade-Fahrenheit conversion chart; specific heats and melting points; heat equivalents; steel heat-treatment chart. All are on two sides of a card handy for hanging on shop or laboratory wall.

Stoneware. U. S. Stoneware Company, 40 Church Street, New York City. Bulletin 402: tanks, pots, jars, stills, tumble mixers, agitators, evaporating dishes, funnels, fillers, etc. Illustrated 8-page folder giving full data on these products.

Piping and Valves. Semet-Solvay Engineering Corporation, 40 Rector Street, New York City. Bulletin 44; 48 pages, illustrated.

Chemicals. The Kalbfleisch Corporation, 535 Fifth Avenue, New York City. Supplement to complete catalog of chemicals, giving data concerning new plants acquired and new company developments in production and distribution of its products. Company makes industrial chemicals widely used in metal and finishing industries.

Proving Instruments. Morehouse Machine Company, York, Pa. Leaflet on instruments for checking testing machines.

Platers' Analysis Sets. Kocour Company, 4724 South Turner Avenue, Chicago, Ill. Leaflets on Nickel pH Comparator; Model "AC" Analytical Set for Determining Sulfuric Acid and Copper Sulfate in Acid Copper Solutions; Model "B" Set for Determining Chloride in Nickel Solutions.

Valves. Mueller Limited, Sarnia, Canada. Valves for concealed plumbing that are readily repaired or adjusted.

Brakes and Bearings. Wagner Electric Corporation, 6400 Plymouth Avenue, St. Louis, Mo. Bulletin SD-338, Automotive Brake Service; S-349, Steel-Backed, Babbitt-Lined Bearings.

Refractories. Charles Taylor Sons Company, Cincinnati, Ohio. P. B. Sillimanite refractories for various types of furnaces, and pyrometer protection tubes and glass-house refractories.

Industrial Heating. W. S. Rockwell Company, 50 Church Street, New York. Bulletin 294, "Economics of Industrial Heating."

Correction

In the last issue it was erroneously stated that a publication, Bulletin 402, on Stoneware Tanks, Pots, Jars, Stills, Tumble Mixers, Agitators, Evaporating Dishes, etc., was issued by the General Ceramics Company. This interesting publication was issued by the **U. S. Stoneware Company**, 40 Church Street, New York City.

Associations and Societies

REPORTS OF THE CURRENT PROCEEDINGS OF THE VARIOUS ORGANIZATIONS

American Electroplaters' Society

Boston Branch

HEADQUARTERS, CARE OF ANDREW W. GARRETT, 45 KING STREET, DORCHESTER, MASS.

Regular meeting of Boston Branch was held June 4th at the American House, with President Gale in the chair. The election of delegates to the Rochester convention was put over for two weeks.

Mr. Campbell of the chemistry class made an excellent report of the progress the students were making. Every member was present at all the meetings of the class, and it is felt that they were amply rewarded. The class at present are using Sizelove's "Platers' Guidebook" as a textbook, under the able instruction of Mr. Cahill, who is in hearty co-operation with every member of the class. Financially the class was in excellent condition and all expenses were met cheerfully by the members. This was $429.25.

The new officers of the Branch are: President L. Gale; vice-President, C. Hardy; secretary-treasurer, A. Garrett; sergeant-at-arms, I. Ober; librarian, F. Mackie; board of managers, C. Campbell, chairman; B. Lee and F. English.

We had with us our old friend, Frank Clark, who gave us a very interesting account of one of the chemical classes he had visited in his travels.

A new member, I. H. Ober, gave us a treat by reciting two poems.

The next meeting will be held the first Thursday in September.

A. W. GARRETT, Secretary.

Porcelain Enamel Institute

HEADQUARTERS, 612 NORTH MICHIGAN AVENUE, CHICAGO, ILL.

The Porcelain Enamel Institute announces the addition of a Manufacturers' Technical Consultation Service to its other activities. The service, according to the announcement, is for the benefit of manufacturers who wish to determine whether porcelain enamel is a finish adaptable for use on their products. It is felt that a consultation service of this type will fit in very well with other of the Institute's research and product development activities.

The Electrochemical Society

HEADQUARTERS, COLUMBIA UNIVERSITY, NEW YORK CITY

Convention at Salt Lake City

The Electrochemical Society will meet at Salt Lake City for the first time when it holds its annual convention there September 2 to 5, inclusive. Members are planning to take advantage of the opportunity to make the trip a pleasure tour as well as for the scientific aspects of the convention. Headquarters will be at the Hotel Utah. Special rail rates have been arranged.

A very excellent program has been arranged. It includes a number of lectures, plant visits and trip into the Rockies and other scenic districts in the region.

Thursday, September 3, at 9 A. M., there will be a scientific-technical session at which papers will be read on Electric Furnaces and Electrodeposition. Dr. Bradley Stoughton will preside.

British Non-Ferrous Metals Association

HEADQUARTERS, REGNANT BUILDINGS, EUSTON STREET, LONDON, ENGLAND

The new headquarters of the British Non-Ferrous Metals Association in Regnart Buildings, Euston Street, London, were formerly opened on June 8 by Lord Rutherford, who spoke of the beneficial work of the organization during the past decade, alike in regard to quality and quantity.

The new headquarters of the Association are in a building consisting of four floors, each of approximately 2,500 sq. ft. On the ground floor are the general offices, library and information bureau; on the first floor the development department, embracing both an exhibition room and workshop facilities for some of the lighter and experimental work; on the second floor there is a general research laboratory; the basement floor is laid out for melting, casting, working, mechanical testing, and in general the heavier work of both the research and development sections. The general equipment represents rather a triumph for those responsible for the work, for until the Association got these headquarters—it entered into possession in last September—it possessed very little plant or apparatus of its own. Its resources have now been very considerably strengthened. A. E.

Personals

Dr. Edwin Fitch Northrup

The Electrochemical Society has awarded the Edward Goodrich Acheson Medal for 1931 to Dr. Edward Fitch Northrup, the board of directors of the society unanimously concurring in the award to Dr. Fitch for his important work in the development of the high frequency induction furnace.

Dr. Northrup was born in Syracuse, N. Y., on February 23, 1866. His undergraduate studies were pursued at Amherst College; thence he went to Cornell. During the years 1893-1895 he was a fellow in physics at Johns-Hopkins University, receiving the Ph.D. degree in the latter year. After spending three years in the west, he returned to Baltimore to accept the post of the assistant to Professor H. A. Rowland at Johns-Hopkins. From 1903-10 he was secretary of the Leeds and Northrup Company, manufacturers of high grade electrical instruments. From 1910-20 he was assistant professor of physics at Princeton University.

DR. E. F. NORTHRUP

Since 1916 Dr. Northrup has devoted himself chiefly to the development of new methods of inductive heating. His first practical high frequency furnace was in operation in 1917. Today Northrup high frequency furnaces are used all over the world for the melting of all types of metals and alloys.

Dr. Northrup's hobby is the breeding of a superior strain of pointer dogs and going hunting with them. Recently he has also become a quail fancier.

Alexander Klein of New York City, polisher and plater, is sought by the National Desertion Bureau, Inc., 67-71 West 47th Street, New York City. The Bureau states that Klein is 43 years of age, 5 ft. 6 in. tall, weighs 160 pounds, has gray hair and blue eyes; arrived in the United States from Hungary about 19 years ago; has deserted his wife, Rose, and his 13 months old child, Bernard J., and has neither communicated with them nor sent them any support, thus leaving them in destitute circumstances and dependent upon local charities. Communications should be sent to the Bureau at the address given.

Leo H. Booch, for the past twenty years manager and president of the Bridge and Beach Manufacturing Company, St. Louis, which company has recently been reorganized on a reduced scale, has returned to Dallas, Texas (address 2906 Maple avenue), to resume the manufacturer's agency business in which he was successfully engaged prior to 1911.

L. W. Mac Farland, president of the Mac Farland Manufacturing Company, Inc., sailed for Europe on the Leviathan on May 9th. The purpose of his trip was an investigation of one or two lines which his firm is developing, and to investigate the polishing of metals in the large plants of France, Germany, Belgium and England.

George F. Newell has been elected vice-president and general manager of the Pyrometer Service and Supply Corporation, 1988 East 66th Street, Cleveland, Ohio, a subsidiary of the Claud S. Gordon Company of Chicago, Ill., pyrometer and industrial X-ray engineers.

Otto Lutherer, who has been research engineer at the laboratory of the American Gas Association, has been appointed chief engineer of the North American Manufacturing Company, Cleveland, Ohio, maker of turbo-blowers and combustion equipment.

J. Walter Becker has resigned from the Turner Brass Works, Sycamore, Ill., because of poor health. Mr. Becker was vice-president and general manager. **John Slezak,** works manager since 1930, succeeds Mr. Becker.

George F. Todd has resumed his connection as brass foundry foreman for T. McAvity and Sons, Ltd., St. John, N. B., Can., after a leave of absence of some months.

Obituaries

Aaron Rodewell Todd

Brief mention was made in the previous issue of the death of Aaron Rodewell Todd. Mr. Todd died in Washington, D. C., on May 2nd, 1931, from a heart attack, at the age of seventy. He was for approximately forty years associated with The Hanson and Van Winkle Company of Newark, New Jersey, manufacturers and dealers in electroplaters' and polishers' equipment and supplies, and when in 1927 The Hanson and Van Winkle Company merged with A. P. Munning and Company to form Hanson-Van Winkle-Munning Company of Matawan and Newark, New Jersey, he continued his association until a year or so ago, when he retired from business.

Mr. Todd's association with the plating industry began at the time of the incorporation of The Hanson and Van Winkle Company in 1891 by Mr. Van Winkle, E. N. Todd, Mr. Van Winkle's son-in-law and A. R. Todd's brother, and other associates. A. R. Todd was the sales representative of the company in the metropolitan district, in which territory he continued active until his recent retirement. He was for many years recognized as the dean of the industry's sales representatives, and is remembered with respect and affection by innumerable friends and customers, many of whom are still loyal to the associations established by Mr. Todd. Rarely does a personality become so generally and favorably recognized in an industry as the many expressions of sympathy and regret received from customers and friends show Mr. Todd to have been. We wish to join with others in expressing our real sympathy and sense of loss to his widow.

Dr. Henry V. Walker

Dr. Henry V. Walker, president of Henry V. Walker Company, Elizabeth, N. J., manufacturers of lacquers and enamels, died July 4, 1931, at New York City, several days after a surgical operation. Dr. Walker, who was a resident of Newark, N. J., was 59 years old.

Alfred T. Wagner

Alfred T. Wagner, 2700 Wright Street, Detroit, Mich., head of the plating supply firm of that name, was killed last month in an automobile accident.

News of the Industry

Industrial and Financial Events

Norton Company—Behr-Manning Merger

Announcement has just been made of a plan for consolidation of the Norton Company, Worcester, Mass., and Behr-Manning Corporation, Troy, N. Y., two companies prominent in different branches of the abrasive industry. The merger will be made through exchange of stock the exact details of which are not made public. The capital stock of each company has always been closely and privately held and is not listed on any of the exchanges.

The Norton Company was founded in 1885, making emery grinding wheels. The company later pioneered in development and manufacture of abrasives by electric furnace processes.

The Behr-Manning Corporation, founded in 1874, is a leader in the sand paper industry, particularly in the development of abrasive papers and cloths for machine and technical uses. They have a large modern plant and main offices at Troy, and important foreign affiliations.

Plans call for continued operation of the two companies under present names, managements, and organizations. Their different lines of products are without duplication, but in great measure supplementary. Advantages of the merger should be in diversification of interests, economic savings in operation and management, greater financial strength, and increased research and technical development.

American Brass Company

The Stratford, Conn., Town Council at a special meeting held last month was informed that the American Brass Company planned the construction of a million dollar plant in Stratford, if proposed dredging of the Housatonic river takes place. The firm, it was said, will erect the new plant on its property located between the railroad bridge and Washington bridge on the Stratford banks of the Housatonic river.

Councilman E. B. Sniffen made the report to the council during a discussion of the proposed dredging of the river. He pointed out that the town in two years would receive in taxes from the property enough money to recompense it for the $25,000 appropriation as Stratford's share in the channel work. In this connection, the council tentatively decided to contribute $15,000 as Stratford's share of the $150,000 which must be raised by towns and industrial concerns interested in the dredging of the river before the government will undertake the task.

Republic Metals Corporation

Republic Metals Corporation, New York, has extended its plant in Brooklyn to take in the entire block bounded by Provost, Freeman and Green Streets, the building formerly occupied by the Wiarda Chemical Company. Considerable new equipment is being installed as well as a copper furnace for the manufacture of ingot copper which will be ready for operation within the next few weeks.

The foundry is equipped with a large traveling train and other facilities for efficiently handling material within the plant. Oil and coal fired furnaces as well as electric furnaces are used to melt and refine the various white metals, the company specializing in solder, babbitt, type metals, zinc and lead. A. Salomon is president, Leicester A. Saloman is vice president and Morton F. Salomon is treasurer.

Brass Ingot Statistics

Combined deliveries of brass and bronze ingots and billets by the members of the Non-Ferrous Ingot Metal Institute, Chicago, Ill., for the month of May, 1931, amounted to 4,220 tons, according to the Institute.

The average prices per pound received by the membership on commercial grades of six principal mixtures of ingot brass during the twenty-eight day period ending May 22nd were as follows:

Commercial 80-10-10 (1% impurities), 9.853c; Commercial 78%, 8.057c; commercial, 81%, 8.510c; commercial 83%, 8.713c; commercial 85-5-5-5, 9.007c; commercial No. 1, 7.001c.

On June 1st, unfilled orders for brass and bronze ingots and billets on the books of the members of the Institute amounted to a total of 20,817 net tons.

Schenck Memorial

On May 22 a memorial flagpole to Peirce Davies Schenck, founder of The Duriron Company, Inc., Dayton, Ohio, was dedicated by the employees of the company. The concrete base was designed by Dale Augsburger, member of the Dayton office, and carries a tablet cast in "Durimet," a chrome-nickel-silicon alloy steel developed by Mr. Schenck. The tablet bears the inscription: "Erected to the Memory of Peirce Davies Schenck, Founder of The Duriron Company." The dedication address was given by William E. Hall, New York, who succeeded Mr. Schenck as president. The acceptance speech was made by Robert C. Schenck, son of the founder, and secretary. Charles Sheeley, machine shop foreman, gave a brief history of the company and his recollections of Mr. Schenck, with whom he was associated for 15 years.

Aluminum Truck Bodies

The Ario and Rosman Metal Body Corporation, 426 De Witt Avenue, Brooklyn, N. Y., are now manufacturing the first all aluminum coal truck body to be used by a large Brooklyn coal dealer. The body is a 7-ton gravity discharge type. It will be mounted on a truck chassis built to hold a 6-ton steel body. This increased ton of payload will pay for the extra cost of aluminum over steel in a comparatively short time, it is stated. After that time, the truck will be earning extra money for the company in the form of lower operating costs and extra payload, the makers state. Aluminum lift-type coal bodies have been produced with marked success in other cities. Ario and Rosman are pioneering their introduction in New York, and the project is being watched with keen interest by coal dealers.

Dust Studies

Studies by the United States Public Health Service have shown that there is a great difference in the harmfulness of dust. Of those studied, the only dust which had a really serious or fatal effect upon the worker was that containing free silica. It used to be thought that the harmful effect of silica dust lay in the sharpness of particles, but now it is believed that some chemical effect is present, associated with the slow dissolving of the free silica particles, the service states. In the concentrations found, dust encountered in silver polishing, appeared to have no harmful effect upon the workers. The dust concentration was relatively low. The mitigation of the dust hazard in industry is primarily a ventilation problem, it is stated.

New Whitehead Metal Plant

Press reports state that the Whitehead Metal Products Company of New York, Inc., distributor of a variety of non-ferrous metal products, including Monel metal, nickel, nickel silver, brass, copper, bronze and aluminum, will occupy the major portion of a building to be largely of metal at Boston, Mass., now being planned by the Norwhit Company. The building is to be located on the Northern Artery, it is stated. It will have a cast aluminum front, Monel sashes and window frames, brass doors and other interior sections and decorations of copper alloys, according to the report. Full information is not yet available.

Lead Shipments

Industrial classification of domestic lead shipments in the United States for March, April, and May, according to the American Bureau of Metal Statistics, in tons, follows:

	March	April	May
Cable	9,109	9,175	8,433
Ammunition	5,517	3,722	1,609
Tin foil	861	1,798	510
Batteries	2,182	2,684	3,762
Brass-making	111	263	176
Sundries	2,598	2,119	1,817
Jobbers	261	229	228
Unclassified (a)	16,122	15,344	17,546
Totals	36,761	35,324	34,081

(a) Of the shipments reported as unclassified, about one-third moves normally into white lead and about 30 per cent into red lead and litharge, as averages, but it is impossible to make a monthly segregation of the shipments according to these destinations. Other important manufactures are sheet and pipe, solder, and Babbitt metal.

Metals in Die Castings

The use of non-ferrous metals in the manufacture of die castings during the last two years is indicated in the following table, compiled by the American Bureau of Metal Statistics.

In Short Tons

	1929	1930
Zinc	29,051	15,397
Copper	1,563	762
Lead	694	560
Aluminum	8,743	4,449
Tin	554	350
Antimony	139	54
Other metals	657	250

Note: Thirty-nine companies engaged in the manufacture of die castings reported their use of non-ferrous metals for that purpose. The Bureau believes that this group of manufacturers represents about 80 per cent of the industry.

H. W. Hendricks Leaves $4,264,463

The estate of the late Harmon W. Hendricks was appraised last month at $4,264,463 net for tax purposes. Mr. Hendricks, who died March 31, 1928, was president of Hendricks Brothers, Inc., New York, metal manufacturers and dealers, a firm which has been operating continuously since 1813. A considerable part of the estate will go for philanthrophies, including $250,000 to the Museum of the American Indian-Heye Foundation; $10,000 each to Mount Sinai Hospital, Hebrew Orphan Asylum, Home for Aged and Infirm Hebrews, Hebrew Sheltering Guardian Society, United Hebrew Charities, and Congregation Shearith Israel, all of New York; a number of the Hendricks company's employees were left sums ranging up to $20,000 for loyalty.

Welding Demonstration

Whitehead Metal Products Company of New York, Inc., New York City, held a gas and electric welding demonstration on June 26 and 27 at Bush Terminal, Brooklyn, N. Y. Practical tank building and aluminum roofing welding operations were shown by engineers of the International Nickel Company and Aluminum Company of America. Other welding work was on Monel metal, nickel, aluminum and nickel clad steel.

Manufacturers of Metals in Canada

Manufacturers of non-ferrous metals in Canada during 1930 were valued at $259,899,972, or $23,600,000 below the corresponding total for 1929, according to the Dominion Bureau of Statistics at Ottawa. 403 plants were in operation during the year, employing an average of 38,600 persons. Payments for salaries and wages totaled $52,163,575, expenditures for materials used in manufacturing amounted to $117,417,803, and capital employed was reported at $319,701,659.

Producers are grouped into seven industries, each of which showed a decline in output value in 1930. Production from the brass and copper products industry dropped $10,300,000 to $25,828,130; non-ferrous smelting and refineries declined $8,900,000 to $100,946,136; jewelry and silverware industry showed a loss of $1,800,000 to $10,117,486; lead, tin and zinc products declined $1,200,000 to $5,213,542; aluminum products fell to $3,836,972 from $4,263,801; and the miscellaneous group dropped to $765,255 as compared with $1,116,053 in 1929. Output from the electrical apparatus industry, which is the most important of the non-ferrous group, was well maintained and amounted to $113,192,451 as compared with $113,796,002 in the previous year.

Imports of non-ferrous metals and products into Canada during 1930 were valued at $66,926,975, as against $90,686,274 in 1929. Of this total, $54,667,383 or 82% came from United States, and $6,872,931 or 10% from the United Kingdom.

Developments in Metals

WIRE SCREEN CLOTH manufacturers, distributors and users met at New York, June 18, and approved a simplified practice recommendation promulgated by the Division of Simplified Practice, Bureau of Standards. A standing committee of the industry was appointed. The program considers mesh, wire size, width and length of roll, and packing methods of bronze, copper and steel wire screen cloth.

LEAD-COATED COPPER was used for the roof of the new Bank of Manhattan Company building in New York, and also on the Riverside Church (Rockefeller-endowed edifice in New York), and on new buildings for New York's city-owned Hunter College for girls.

OVER 60,000 TONS OF NEW LEAD will be utilized for new cable to be installed by New York Edison system in underground lines during the period 1931-40, according to Lead Industries Association.

COPPER consumption by electric light and power companies of United States in 1930 amounted to about 260,000,000 pounds, a new high record and a gain of over 330 per cent in annual use of copper by the power companies since 1920, according to Copper and Brass Research Association.

A BRONZE DECORATIVE PLAQUE or shield long believed to have been the work of Benvenuto Cellini, famed renaissance goldsmith and autobiographer, was found by the Bureau of Standards last month to be a spurious electrodeposited reproduction not over 60 years old. The work, which had been valued at $200,000, was subjected to tests at the request of the owner. Dr. William Blum and his associates at the Bureau found by microscopic examination that the plaque was built up of layers of electrodeposited metal rather than a lost-wax casting which it should have been if original.

AN INCH OF BRASS AND A FOOT OF LEAD were drilled easily by a 2,600,000 volt electric ray generated by the German physicists, Drs. F. Lange and A. Brasch of University of Berlin, who are experimenting in the construction of apparatus which will capture and harness lightning bolts rated at approximately 16,000,000 volts.

ALUMINUM FOIL from three ten-thousandths to three thousandths inch in thickness was wrapped around steam pipes by research workers at Pennsylvania State College and was found to insulate the pipes more efficiently than an inch of ordinary (asbestos-type) covering. It was stated that the smooth, shiny surface is probably responsible for the low heat loss through the foil, which cuts the loss 25 per cent. A wrapping of a single sheet of asbestos paper, which has a dull, rather rough surface, was found to cause a 10 per cent greater loss than a bare iron pipe which is smooth.

ALUMINUM PAINT has been found to be a highly desirable protective coating for steel boiler tubes and furnaces by research workers at Armstrong College, Newcastle, England.—A. E.

ROOFING TERNES simplified practice recommendation R-30-28, Division of Simplified Practice, Bureau of Standards, was reaffirmed without change by the standing committee of the industry at its May meeting, for the ensuing six months. The program establishes weights and thicknesses and has been instrumental in reducing the number of stock sizes from 9 to 7.

COPPER for automobile license plates has been proposed in Arizona.

SOLAR ENERGY may be harnessed in the near future by means of special photoelectric apparatus being developed in Germany by Dr. Bruno Lange of Kaiser Wilhelm Institute, Berlin. The apparatus requires the use of silver, copper and other metals. Vast power resources, rivalling hydroelectricity, may result from experiments under way.

ALUMINUM sheet, bolts, screws, castings, etc., is being used extensively in construction of the Cleveland, Ohio, municipal stadium; 138,000 pounds of the metal will be used. A still larger amount, it is reported, will be used in construction of train sheds for the Cincinnati Union Terminals Company, Cincinnati, Ohio.

Business Reports of The Metal Industry Correspondents

New England States

Waterbury, Connecticut

JULY 1, 1931.

Factories and employes are once more signing up pledge cards to donate a percentage of their earnings for unemployment relief. The committee in charge allowed the old pledges to lapse May 1 as it was believed the depression was so nearly over that most of those being given assistance could get employment. However, after a month it was found that there were still about 1,000 unemployed who had dependents who would be in sore straits unless given aid.

Scovill Manufacturing Company directors voted last month to maintain the 50 cents a share dividend for another quarter. It will be paid July 1 to stock of record June 15. This is the rate paid for over a year, although before the depression the rate was $1 per quarter.

The taxes paid by the **Scovill Manufacturing Company, American Brass Company,** and the **Chase Companies, Inc.,** to the city of Waterbury last month totaled over $600,000. Only half of the year's taxes were paid last month and the amount paid by the three large concerns is one-fifth of the tax levy for the entire city.

Chase Companies, Inc., is named as a creditor with a claim of $876 in the schedule in bankruptcy filed by the **United States Auto Lamp Manufacturing Company** in the Federal Court of New York.

John H. Goss, vice-president of the **Scovill Manufacturing Company,** has received a patent on a floating trim stud. A new trade mark on sheet brass and unfinished forgings was registered for the Scovill company in the patent office last month.

The inventory of the estate of **William H. Bristol,** former head of the **Bristol Company,** was filed in probate court last month. It totals $1,729,602. Of this, $1,351,500 represents stock in the Bristol Company. The second largest stock holding was in the **Scovill Manufacturing Company,** valued at $63,600.

Frederick S. Chase, president of the **Chase Companies, Inc.,** has been appointed by **Governor Wilbur L. Cross** as a member of the commission to represent Connecticut in arranging for its participation in the Century of Progress exposition to be held in Chicago next year.

Charles E. Hart, secretary of the **Chase Companies, Inc.,** has been appointed by the governor as a member of the commission which is to study the subject of old age pensions and make recommendations to the next legislature.—W. R. B.

Connecticut Notes

JULY 1, 1931.

TORRINGTON—After a silence of two years during which this country and Canada was searched for him, **Lyman B. Comstock,** former sales manager of the **American Brass Company,** and former manager of the Torrington Branch of the company, has been located at Fort Dick, Del Norte County, Calif.

The directors of the **Torrington Company** have declared the regular quarterly dividend of 75 cents a share payable July 1 to stockholders of record June 15.

One hundred and fifty men were laid off last month in the nipple department of the **Standard Manufacturing Company** of this city. Not long ago the company received a large order for nipples and placed three shifts of men at work filling the order, but as this order is nearly filled most of the extra men taken on must now be laid off.

NEW BRITAIN—North and Judd Manufacturing Company directors have declared the regular quarterly dividend of 50 cents a share, payable June 30 to stockholders of record June 19.

Landers, Frary and Clark directors have declared the regular quarterly dividend of $1 a share.

Hart and Cooley Company has declared the regular quarterly dividend of $1.50 a share.

HARTFORD—Arrow-Hart and Hegeman Electric Company directors have declared the regular quarterly dividend of 50 cents a share on the common stock and $1.62½ on the preferred stock. Reports presented at the meeting disclosed that the company's earnings are favorable, business in general being described as good.

Colt's Patent Fire Arms Company has declared a quarterly dividend of 38 cents a share.

Standard Screw Company directors have declared a quarterly dividend of $1.50 a share on the common and the regular semi-annual dividend of $3 a share on the preferred stock.

NEW HAVEN—Winchester Repeating Arms Company has been granted a release from a portion of its taxes as an aid by the city to assist in its rehabilitation. Judge Hincks of the United States District court has issued an order permitting the Chase National Bank of New York, as trustee for the bondholders, to foreclose the mortgage on the property. This is not expected to interfere with the operation of the plant under the receivership.

NORWALK—Segal Lock and Hardware Company directors have declared the regular quarterly dividend of 12½ cents a share in cash or 2½ per cent in stock, at the option of stockholders. The company plans to resume operations at its plant in Brooklyn, N. Y., on a 24-hour schedule because of increased business. Machinery will be rebuilt and will be in service by another month.

BRISTOL—Bristol Brass Corporation directors have declared the regular quarterly dividend of $1.75 a share on the preferred stock.

MERIDEN—International Silver Company directors have declared the regular quarterly dividend of 1¾ per cent on the preferred stock.

TERRYVILLE—Eagle Lock Company will be closed for two weeks from July 3 to July 17 for taking inventory.

BRIDGEPORT—The resignation of **George T. Wigmore** of Naugatuck as secretary and treasurer of the **Bridgeport Brass Company,** reported in these columns last month, was accepted at the quarterly meeting of the directors June 24. **Ernest S. McClary,** assistant treasurer and secretary, was elected secretary and treasurer. **Leonard Allen,** credit manager was appointed assistant treasurer, and **William R. Breetz** was appointed assistant secretary. **Salwyn Bywater** of New York was elected a member of the board of directors.

Connecticut Electric Manufacturing Company of this city will be sold to the **Industrial Management Company, Inc.,** New York, if approval of the sale is authorized by the superior court. A deposit has been required by the court before giving approval of the sale. The price is $200,000.—W. R. B.

Providence, Rhode Island

JULY 1, 1931.

A large order for special machinery has been received from England by the **Langelier Manufacturing Company,** which, with other business on hand will be sufficient to keep the plant operating on a full time schedule until the middle of August, according to information from **H. K. Allard,** treasurer of the concern. He states that the company has been gradually increasing its payroll and that employment there is approaching normalcy. The English order is for a swedging machine, one of the largest of this type ever made and is a duplicate of those recently made for the United States Steel Corporation. The company has been engaged in filling orders for the Soviet Government and more business from that source is anticipated.

Welsh Manufacturing Company, now located at 107 Stewart Street, Providence, recently purchased the building in Olneyville formerly occupied by the American Woolen Company and

will fit the top floor of the building for its own occupancy, renting out the remainder.

Metal Finding Manufacturers' Association at its regular meeting last month elected its officers for the ensuing year. There were twenty-seven members present at the luncheon which preceded the business session at Narragansett Hotel.

Vennerbeck and Clase Company, manufacturers of rolled gold plate, seamless wire and tubing, 150 Chestnut Street, celebrated its golden jubilee on July 1st, having been continuously in business since July 1, 1881. The concern is now the oldest manufacturer of rolled gold plated products in the industry.

Manufacturers are more generally concerned over the mounting costs of local government because they are the heaviest taxpayers, **James A. Emery,** general counsel of the **National Association of Manufacturers,** declared the other day before a group of mill men in the Biltmore Hotel. He was the guest of **Henry D. Sharpe,** of the **Brown and Sharpe Manufacturing Company.** Unless expenditures of municipalities are curtailed, the present business depression will be aggravated, he said, in pointing out that annual outlay by the cities and towns now totals thirteen billions.

In a recent address before the **Metal Finding Manufacturers' Association** in this city, **J. William Schultze,** president of **Alfred Vester Sons, Inc.,** Providence, manufacturers of findings, advocated the standardization of cost finding methods in the jewelry industry, Mr. Schultze said that at a meeting which he attended at Cleveland several years ago, 37 leading manufacturers, all using the same set of figures, arrived at prices varying from $3.37 to $11.06 for the same item. "Each of us has his own way of figuring these things," said Mr. Schultze. "Even experts disagree when it comes to theories in cost finding. What I wish to emphasize is that in an industry, particularly one which is as small and compact as jewelry manufacturing, there should be a uniform method. It makes no great difference which method is finally adopted if we all use the same general scheme. I am not talking about the use of the same figures or the same percentages. I am merely talking about principles and rules for handling by name, not by amount of percentage, the various elements of cost and expense which go into the manufacture and sale of our product."

Isacco Bros., Inc., Providence, has been incorporated to manufacture jewelry; authorized capital, 100 shares common stock of no par value. The incorporators are: **Falco A. Isacco,** 52 Wisdom Avenue, **John G. Isacco** and **Edward Isacco.**

Isadore S. Horenstein, local attorney, has been appointed trustee in bankruptcy of the **Union Pencil Company,** Providence, under bond of $2,000.

W. H. M.

Middle Atlantic States

Newark, New Jersey

JULY 1, 1931.

An unusual piece of building construction is under way at the **Art Metal Works** plant on Mulberry Street and Aronson Square. A factory building is being constructed within a factory building, and the work does not disturb the workers in the four- and six-story plant. The widening of Mulberry Street will remove a large slice of the Art Metal Works plant. In the heart of the plant itself new four- and six-story additions to the main building are being constructed to meet the changed conditions, and by August the workers in the plant will find themselves in practically new quarters. The new building job, with new machinery, will cost in the neighborhood of $400,000.

Vice-Chancellor Church has approved the final report of receivers of the **Kolster Radio Corporation.** There was no opposition from stockholders. Kolster's assets were sold in April to the Orange Securities Corporation for $3,000,000. All merchandise creditors were paid in full last year. The report shows a balance of $242,590 to be distributed among preferred stockholders. Owners of common stock will not receive anything.

Assistant Prosecutor Felix Forlenza has been named receiver for the **Euro-American Corporation,** 135 New Jersey Railroad Avenue, chemical manufacturers, by George W. Porter, referee in bankruptcy.

Following Newark concerns have been incorporated: **Fulton Brass Foundry Company;** castings; $50,000. **Copper Alloy Foundry Company;** metals; $125,000. **Capitol Radio Tube Company;** radio tubes; 2,500 shares common. C. A. L.

Trenton, New Jersey

JULY 1, 1931.

Encouraging reports continue to come from some of the metal plants in Trenton. **Jonathan Bartley Crucible Company,** manufacturers of refractory containers and high-temperature material, reports business increasing. Since the middle of April the firm has been rushed with orders and the factory is now overtaxed to deliver its finished product. **Lewis Lawton,** president of the company, says it may be necessary to add a night force and employ a double shift. Virtually all the orders received by the firm lately have been for apparatus of special design from a number of companies using the goods made by the Bartley Company.

Meredith E. Johnson, assistant State geologist, believes that a new mineral industry may be started in New Jersey—that of mining ochre, a yellowish coloring matter used in the manufacture of paints and varnishes. Small percentages of the mineral have been found in abandoned limonite mines near Carpentersville, Warren County. This discovery, together with an increased demand for the product, has resulted in considerable prospecting.

C. Howard Hunt Pen Company, Camden, will exhibit at the second annual American Fair, to be held in Atlantic City from July 16 to August 26. There will be an exhibit representing the State of New Jersey generally, financed through a state appropriation of $25,000.

Following concerns have been chartered here: **G. and E. Chemical Company;** $50,000; Atlantic City, N. J. **Briggs Refinishing Company,** refinishing of metals, 500 shares common, Bloomfield, N. J. **General Tungsten Manufacturing Company;** $50,000; manufacture lights; Union City, N. J. **Keldur Corporation;** chemicals; $100,000; Jersey City. **Sherwin Welding Company, Inc.;** $50,000; Elizabeth, N. J. C. A. L.

Central New York

JULY 1, 1931.

Metal trades in the Utica area showed the greatest increase in hours worked and in employment during May of any Central New York industry, according to the charts just released by the Industrial Association, which tabulates employment figures at its Utica office for industry throughout New York State.

An increase of 1.5 per cent in employment in the metal industries in this area, and 1.1 per cent increase in the hours worked, is listed in the association tabulations.

In the metals the number employed in April was 74.3 per cent of what the association terms the normal figure, while in May the percentage totalled 75.8. In hours worked the metal trades showed a percentage of 79.2 of normal in April, compared with 80.3 per cent in May.

Association officials asserted that while the Utica area is displaying a comfortable increase, Rome, where copper and brass industries predominate, is not much more than marking time.

Figures given out by the association show that at present about 4,500 men are employed in the Utica and Rome metal trades, with about 3,100 employed in Rome. With copper scraping the bottom officials of Rome industries are reluctant to make any comment on the state of their business. Many of the Rome plants are working part time with a three-day-a-week schedule in practice in most of the factories.

A general survey of the Central New York area is not conducive to optimistic statements at present, association officials said, except for the immediate Utica area where the upward trend in metals since February has been gradual. E. K. B.

Middle Western States

Detroit, Michigan

JULY 1, 1931.

Manufacturing has not shown any particular stimulation during the past month. This is particularly true as to brass, copper, aluminum, gray iron, and also plating. Most of these industries are operating on a part time basis, with production curtailed even to a greater extent than earlier in the year. There is no use overlooking the fact that manufacturing and business in general have not met with expectations. While the motor car industry has made a brave effort to maintain substantial production, this business is gradually tapering off in spite of the frequent introduction of new models in an attempt to arouse interest and increase sales.

Buhl Aircraft Company, Marysville, Mich., recently established a record for shipments of completed planes when fourteen "Bull Pups" left the plant. Eight went in one car to the distributor at Los Angeles, while the others were sold separately. The announcement came from **J. J. O'Brien,** managing director of the company. The "Bull Pup" is a single seater, center-wing monoplane.

Alfred T. Wagner, 50 years old, owner of the foundry supply company bearing his name at 2700 Wight Street, Detroit, was injured fatally on May 26 when he was hurled from the window of his car as the result of a collision. He died while being taken to the hospital. Mr. Wagner came to Detroit when he was 17 years old, entering the employ of Frederick B. Stevens, Inc. A few years later he organized his own company.

Arnold Lenz, general manager of the Chevrolet foundry at Saginaw, Mich., is one of the members of the citizens' advisory commission recently appointed by Gov. Brucker to study the problem of employment stabilization for Michigan industries.

Automobile Fan and Bearing Company, Jackson, Mich., has adopted a program of diversified production which is working out to its advantage. It is now getting into volume production on aviation equipment. In addition to automotive fans and hood hatches it is now turning out airplane wheels, brakes and control parts. Most of the metal parts are made of aluminum alloy. Some of these parts are purchased in the rough and worked in the Jackson plant. This concern is giving another Jackson organization, the **Sheet Aluminum Corporation,** a new outlet for its products.

Metalclad Products Company, Inc., 1450 Buhl building, Detroit, has recently been chartered under the laws of Michigan. The capital stock is $10,000 and the owners are **R. A. Haigh, D. S. Richards** and **A. G. Stevenson.**

National Foundry Sand Company, 18943 Prairie avenue, Detroit, is a new Michigan organization. The capital stock is $10,000.

Buhl Aircraft Company, which is about to move its plant from Marysville to St. Clair, Mich., is planning to erect a $100,000 structure at the latter location. This is said to be the first of a group that will cost $250,000.

Frank Orville Clements, technical director of the research laboratories of the **General Motors Corporation,** at Detroit, has been nominated president of the American Society for Testing Materials, composed of testing experts and other scientists throughout the world.

Texas-Arizona Mining and Milling Corporation, Madison Square, Grand Rapids, Mich., has recently been incorporated for the purpose of mining, smelting, etc. The owners are **C. M. Ainsworth, G. A. Peavy** and **A. V. Veazey.** The capital stock consists of 50,000 shares of no par value.

George R. Rich, it is stated, is contemplating the erection of a $90,000 manufacturing plant in Battle Creek, to which he would move his present California valve manufacturing plant. An architect will be selected soon, it is stated.

F. J. H.

Wisconsin Notes

JULY 1, 1931.

General Bronze Corporation of New York on June 23 asked the circuit court of Milwaukee to restrain the **Wisconsin Ornamental Iron and Bronze Company** and its officials from engaging in the bronze business until 1944. General Bronze sets forth that July 25, 1929, it bought out the **Wisconsin Art Bronze & Iron Company** for more than $350,000 and that it was agreed that its officials, **W. C. Schmeling, F. Van Kooy** and **Arthur R. Stark,** would not engage in a competitive business for 15 years. The three continued to work for General Bronze, but left shortly afterward on their own volition, it is alleged. In March, 1931, contrary to the agreement, Schmeling, Van Kooy and Stark organized the Wisconsin Ornamental Iron and Bronze Company and began competing with General Bronze, the New York firm complains. It is alleged that the local men solicited business from old customers of Wisconsin Art Bronze and Iron, as well as of General Bronze, much to the latter company's damage. According to General Bronze, the defendants agreed not to compete in any state but Nevada.

A million dollar exposition, open to the public, was staged at the Milwaukee Auditorium June 22, 23, 24 and 25 in connection with the 49th annual convention of the National Master Plumbers' Association. Among the concerns displaying at this exposition was the **American Brass Company,** Waterbury, Conn.; **Chase Brass and Copper Company, Incorporated,** Waterbury, Conn.; **Imperial Brass Manufacturing Company,** Chicago; **International Nickel Company, Inc.,** New York; **Kelly Brass Works,** Chicago; **Mueller Brass Company,** Port Huron, Mich.; **Revere Copper and Brass Inc.,** Dallas division, Chicago; **Turner Brass Works,** Sycamore, Ill.; **Wolverine Brass Works,** Grand Rapids, Mich. Approximately 30,000 people attended the exposition, admission to which was free.

Other Countries

Birmingham, England

JUNE 19, 1931.

The instability of the metal markets generally has continued throughout the month, and at the beginning of June copper prices fell to a new low level. This has had its reaction on brass pipe and copper sheet prices. Naturally, there is no confidence in the market and buyers are few. There is practically no industry in the Birmingham district connected with metal manufacture making a satisfactory turnover. Brassfounders who supply the building trades have found a little improvement, but it is mostly in the way of lower priced goods used in municipal housing schemes. There is still very little life as far as private enterprise is concerned.

The British Non-Ferrous Metals Research Association has just opened its new headquarters and laboratories in London after a period of useful work at Birmingham. (See page 317.)

W. R. Barclay, who until recently was managing director of **Henry Wiggin and Company, Ltd.,** Birmingham, has been appointed consulting metallurgist to the **Mond Nickel Company, Ltd.,** and will have his headquarters in London. Mr. Barclay is a prominent member of the Institute of Metals in the Birmingham Local Section, and is also a vice-president of the parent body. He has contributed important papers and has exerted a wide influence in the non-ferrous metal trades in Birmingham.

Novelli and Company, Ltd., London, who recently acquired

a works in Birmingham, is seeking a patent for a process by which they are chromium plating and nickel plating aluminum ware of various descriptions. Such articles as teapots, vegetable dishes and other lines have been plated in this way with the result that a brilliant finish is obtained. It is a secret process at the moment; the company is understood to have developed it after several years of research and experimental work. It is claimed that when applied to aluminum hollow-ware it will not tarnish and is easily cleaned by rubbing with a wet cloth. The new works at Birmingham has about 10,000 square feet of floor space and has been divided into compartments for plating, polishing and shipping.

Aluminum hollow-ware manufacturers in this district are doing a fair trade at home, but there is no sign of any revival in the chief export markets.

J. A. H.

Business Items—Verified

Best Die Casting and Stamping Company, Inc., New York City, has removed to larger quarters at 54-56 Bleecker Street.

A. Archambault, 8010 Henri Julien Street, Montreal, Canada, is manufacturing brass and bronze castings and aluminum die castings.

St. Paul Brass Foundry Company, 451 East 6th Street, St. Paul, Minn., recently erected a new foundry, 60 x 90 ft. which cost $25,000 with equipment. Firm casts brass, bronze and aluminum.

C. A. Lawton Company, De Pere, Wis., manufactures brass, aluminum and gray iron castings. The company also operates machine and pattern shops, and manufactures power transmission machinery, air compressors, etc.

Milwaukee Flush Valve Company, of Milwaukee, Wis., recently adopted a group life insurance policy for the protection of sixty-eight workers. The policy was issued by the Prudential Insurance Company of America for a total of $94,000.

Erie Resistor Corporation, Erie, Pa., has completed a one-story addition, at cost of about $30,000 with machinery. This company manufactures high resistance products and kindred equipment; is not in the market for equipment at present.

Monarch Machine Tool Company, Sidney, Ohio, has opened an office at 547 West Washington Boulevard, Chicago, Ill., under personal charge of Martin J. Luther. Complete lathe service will be offered. Showroom will have facilities for solving turning problems.

Fusion Welding Corporation, Chicago, Illinois, has appointed the **Puritan Compressed Gas Corporation,** Kansas City, Missouri, as distributors for the "Weldtie" line of welding rods. The territory served by the Puritan firm will include Kansas and western Missouri.

Watervliet Iron and Brass Foundry, Inc., Watervliet, N. Y., is planning expansion. The company has recently arranged for an increase in capital from $25,000 to $75,000, part of proceeds to be used for such purpose. Departments operated: brass, bronze and aluminum foundry.

A petition in bankruptcy has been filed against **Joseph Berliner,** Philadelphia, Pa., scrap dealer and manufacturer of secondary white metals, by Louis Robbins, Land Title Building, Philadelphia, an attorney who represents creditors. Schedules of assets and liabilities are not given.

Orange Manufacturing Company, 190 Emmet Street, Newark, N. J., manufacturer of metal badges and other metal goods, has leased space in a building at 63 Hoyt Street for a new and modern plant. Departments operated: stamping, soldering, plating, polishing, grinding, lacquering.

A. and R. Iron Works, Inc., and the **Removable Steel Bodies Company, Inc.,** have merged as the **Ario and Rosman Metal Body Corporation,** 426 Dewitt Avenue, Brooklyn, N. Y., for the manufacture of steel and aluminum truck bodies, containers, patented roll-off equipment, and commercial metal products.

Charles Hardy, Inc., importers of ferrous and non-ferrous ores and alloys, have moved their offices to the Chrysler Building, 42nd Street and Lexington Avenue, New York, having formerly been located at 122 East 42nd Street. Their telephone number has been changed to MUrray Hill 2—5930-1-2.

Zane Casting Company, Zanesville, Ohio, is erecting three buildings which will house a foundry, machine shop and store room. The new additions will facilitate the production of bronze, brass, other nonferrous alloys and semi-steel castings weighing from 1 pound to 10 tons. Departments operated: smelting and refining, foundry; tool room; casting shops; grinding.

H. W. Knight and Son, Seneca Falls, N. Y., has been incorporated under the same name. The company manufactures pattern letters and figures, operating a nonferrous foundry. It was established by **H. W. Knight** in 1863. Present owners are **H. D. Knight, Dr. Robert Knight,** and **Robert W. Knight,** who are president, secretary-treasurer and vice-president, respectively.

United States Smelting Works, Philadelphia, Pa., has acquired a one-story building and property at Bristol and American Streets, 95 x 120 ft., and is using it as its new plant. The company recently sold present plant site and has removed to new location, where capacity is greatly increased. Company manufactures wire and bar solders, pig and bar tin, lead, copper, spelter, antimony, etc.

Whitby Malleable Iron and Brass Company, Ltd., Whitby, Ont., Can., is the name of the company formerly operated as the **Hatch Manufacturing Company.** The company produces malleable, brass, and aluminum castings and maintains machine and pattern shops. Departments operated: brass, bronze and aluminum foundry; brass machine shop; stamping, tinning, polishing, lacquering, japanning.

American Hammered Piston Ring Company, Baltimore, Md., subsidiary of the Bartlett Hayward Company, N. Scott Street, Baltimore, produces gray iron, brass and aluminum castings and maintains a machine shop, pattern shop and laboratory. The company operates an experimental laboratory and the following departments: brass, bronze and aluminum foundry; tool room; casting shop; grinding room.

E. Reed Burns Manufacturing Corporation, Brooklyn, N. Y., has appointed as representatives and sales agents for its line of buffs and polishing compounds **B. M. Diver,** 810 Stephenson Building, Grand Boulevard at Cass, Detroit, Mich., to cover Detroit and the state of Michigan; and **W. C. Chapman,** 508 Chestnut Hill Avenue, Baltimore, Md., to cover Baltimore, Washington, the state of Maryland and part of Virginia.

Canada Wire and Cable Company has begun operation at Montreal East, Canada, of the hot copper rod mill built by the **United Engineering and Foundry Company.** This mill, which will roll all types of copper rods, contains many new developments devised for the industry by United's engineers to facilitate production and operating economies. The mill was built in record time, the order having been placed in October, 1930.

Tallman Brass and Metal Ltd., Hamilton, Ont., Can., has been completely reorganized under the receivership of **G. T. Clarkson.** The Doehler die casting process is used in that department and under the new arrangement its capacity has been increased. Other products are metal stampings, spinnings, brass, bronze and aluminum castings, and solid and cored bars. Company has machine shop and does plating, polishing, grinding, lacquering, etc.

Philadelphia Quartz Company, Philadelphia, Pa., will observe the one hundredth anniversary of its establishment on July 21. The company was founded in 1831 by **Joseph Elkinton,** candle and soap manufacturer, operating under his own name. Progress and expansion have been steady, and the firm is now a leading producer of soluble silicates, having ceased soap manufacture in 1904. Descendants of Joseph Elkinton still manage the firm. An interesting booklet has been published giving the firm's history and describing its present status.

Review of the Wrought Metal Business

By J. J. WHITEHEAD

President of the Whitehead Metal Products Company of New York, Inc.

JULY 1, 1931.

Evidently the necessary fundamental business adjustments have been completed and just at one of the darkest moments the unexpected, as usual, completely turned the situation. It is believed that we have definitely turned the corner and that from now on, with minor recessions intervening, business will improve. Traffic is surely getting back on the railroads and this means that larger quantities of merchandise are being needed. From a careful study of the situation it looks as if the shelves of merchants, distributers and jobbers are very bare. The inventories of these handlers of finished goods are nil. The accumulation has occurred as far back in the line as possible, that is in the hands of the original producer of the raw material. That is the reason why we have such stocks of copper, zinc, lead, sugar, tin, cotton, etc. A careful consideration of the situation will make it apparent that these stocks, especially in the case of copper, are not so large as would seem to be the case at first glance. The refined stocks showed a further upward increase in May but with the buying movement during June the refined stocks should fall off. Let us estimate them at 350,000 tons as of July 1st. The minimum refined stock normally required to properly carry on the business of the industry should never, nowadays, considering the rate of consumption, fall below 200,000 tons. This leaves excess stock of 150,000 tons. It is believed that this excess stock of copper of 150,000 tons of refined should now be in the hands of distributors or other suppliers of the material in the form of sheets, tubes, rods, wire, etc. The user of such products should also have some copper available for his secondary fabricating efforts. The contrary is true, however, shelves of everybody but the producer are bare. Not only are the shelves of the users of copper and copper alloys in the form of fabricated shapes bare but in addition the producer has built up his stocks of refined metal at the expense of metal in process. It is therefore necessary for the producer first of all to put metal into process before he can appreciably increase production, and this means at least three or four months.

What is true of copper is true also for other metals, and for general merchandise.

It is expected that the coming months will see a tremendous demand for manufactured products of all kinds. Copper requirements will probably be bought considerably, while the price is below the average price of production.

The improvement noted in the copper and brass business has also taken place in the nickel and Monel field. These metals have not had the recession in price that occurred with copper. This fact tended to keep them on a more even keel. Now the demand is increasing. Wise users are covering their Monel needs.

Pick up in the demand for aluminum has also been noted and will continue along with the general business betterment.

Commodity prices have turned the corner. Confidence is rapidly returning and with the constructive events to occur in the near future will soon be firmly established. Business is picking up and the speed toward normal will accelerate more in the near future. Stocks of all kinds of manufactured goods are badly depleted. The stocks of raw materials or commodities are not considered too large, considering the shortages that exist in finished goods. Revival is expected to be more rapid than most people think.

Metal Market Review

By R. J. HOUSTON

D. Houston and Company, Metal Brokers, New York

COPPER

JULY 1, 1931.

Extraordinary developments followed one another in rapid succession in copper, and in the business world generally, during the past month. The price trend of copper remained distinctly downward for the first two-thirds of the month under the continuing influence of heavy oven supplies and slack demand. On June 12 refined copper sold at 8 cents, the record low up to that date for delivered terms, and on June 19 orders for a limited tonnage were booked at 7¾ cents a new low for all-time. The situation abroad was equally depressed, and on June 19 the London market registered the low point in a century and a half at £33.10s. per ton for Standard copper.

A reverse movement, however, set, in on June 22 on the announcement of President Hoover's proposal for a one-year suspension of all intergovernmental debt and reparations payments. This most significant action electrified the world and created a new atmosphere of confidence. Business broadened out and displayed renewed strength in all leading markets of the United States and Europe. Special stimulus was given to copper. The market immediately became active in both the domestic and foreign divisions, the volume of sales for both accounts being notably large. Consuming buying by each group was in vigorous fashion. Export sales absorbed full quota of offerings day after day.

Domestic consumers also were big factors in the active trading on expectations of business improvement and a genuine and substantial market upturn. Prices naturally advanced quickly in response to the highly favorable developments so distinctly essential for world prosperity. The market moved ahead with vigor as large scale buying started prices upward from 8 cents to 8¼ cents and then to 8½ cents with a further increase to 8¾ cents. These market gains were established within the space of four days, and on an enormous wave of buying for account of domestic and foreign consumers. Three advances were made in the export price during the same period. The upward trend for export shipment started at 8.27½c and amounted to ¼c at a time until the basis of 9.02½ cents c. i. f. European ports was reached. Export sales for the month of June thus far amount to nearly 150,000,000 pounds. Combined sales for domestic and foreign shipment to June 27 will total approximately 260,000,000 to 275,000,000 pounds.

ZINC

Transactions were in considerable volume and prices substantially higher at the end of the month. Prime Western zinc was on the low basis of 3.20c East St. Louis a few weeks ago, but prices have been on the upward trend since the middle of June. Sellers maintain a more conservative attitude and were recently able to get 3.60c for nearby shipment and latest quotations were at 3.65c for the western position and 4c New York delivery. Recent offerings, even at advancing figures, were on a limited scale, and both sellers and buyers appear to anticipate a firmer market. The statistical position showed a slight change by the decrease of 163 tons in smelters stocks on June 1. The May production was only 25,688 tons. This was the smallest output for any month in 9 years. Stocks, however, were 143,049 tons on June 1, a total much too large for trade requirements.

TIN

Movements in tin were within a comparative narrow range during a good part of June. A decided improvement both in tone of market and activity developed near the month-end in sympathy with the striking improvement in other metals. Around the close of the month the price of prompt straits was up to 25½ cents a pound as compared with a low of 22.30 cents on June 8. London also advanced to £114 2s. 6d. an advance of £12 2s. 6d. per ton over the low point of the month. Market gains were more pronounced as developments pointed to more favorable factors in the general business situation. Consuming and speculative buying were both in substantial volume.

ALUMINUM

A slackening in demand for aluminum was reported at some centers of industry. The automotive requirements have been covered for nearby shipment, but building construction and other outlets have been important factors in maintaining fair shipments. Prices of prime virgin material show no change. On remelted aluminum prices vary considerably. This metal is becoming more popular for architectural purposes, and good sized quantities are being called for in new construction. Exports of aluminum from Canada in May were 2,491,900 pounds, the largest monthly exports from the Canadian plant this year.

LEAD

Improvement in demand for lead was most pronounced lately. Sales by producers were in huge volume and stimulated by advancing prices both here and abroad. There were four price advances in the last half of June which lifted the New York selling basis from 3.75c to 4.40c. The St. Louis delivery showed an upturn from 3.60c to 4.22½c. Inquiry and transactions were mostly for nearby and July shipment, though a good tonnage was taken for August. All the big consumers were participants in the buying movement which featured the recent activity. July production was about covered by orders booked, and further specifications for that month may have to be filled from reserve stocks. United States stocks of lead on June 1 were at the record total of 142,370 tons.

ANTIMONY

Improved conditions and firmness for all metals extended to the Antimony market. Here the month ended firm and sellers reticent at a rise of a full cent a pound above the low for the month. Early in June the volume of business was limited and Chinese regulars sold at 6 cents duty paid, with rumors of 5.90 cents being accepted on a carload of spot antimony. There was a gradual improvement in tone of market during the second half of June to 6¼ cents. Interest and inquiry increased at the month-end and prices advanced to 6½ cents and later made a sharp rise to 7 cents duty paid. China cables were on the basis of 4¾c to 5c c.i.f. New York with good buying reported at the inside price for future delivery.

QUICKSILVER

Market for quicksilver more or less nominal, with easier tendency recently. Quotations vary according to quantity at $90 on round lots to $92 to $95 for small quantities.

PLATINUM

Refined platinum quotes $37.50 to $40 per ounce, with spot sales for cash reported at several dollars less.

SILVER

A moderate betterment developed in the silver market during June, but prices are still at abnormally low levels. The New York quotation at this writing is 29⅛c per ounce as compared with 26⅜c early in June. China and India were large buyers at recent low figures. Chinese operators were active throughout the month in accumulating supplies at inside figures. Trading on the New York Metal Exchange was begun on a fairly active scale in June.

OLD METALS

Demonstrations of strength have extended to markets for scrap copper and other old metals since the striking gains for commodities generally developed a short time ago. Exporters and consumers are ready to purchase at an advance, but after a long period of depression quotations are somewhat nominal. Holders are hardly satisfied to part with material carried at higher figures simply for a fractional gain. There is more confidence, however, in the situation, and with evidence of sustained strength buyers and sellers will be brought together on a plane of trading acceptable to all parties.

Daily Metal Prices for the Month of June, 1931

Record of Daily, Highest, Lowest and Average Prices and the Customs Duties

	1	2	3	4	5	8	9	10	11	12	15	16	17
Copper c/lb. Duty Free													
Lake (Del.)	8.875	8.625	8.625	8.375	8.375	8.375	8.375	8.375	8.375	8.375	8.375	8.375	8.125
Electrolytic (f.a.s. N. Y.)	8.75	8.50	8.50	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25	8.25
Casting (f.o.b. ref.)	8.25	8.25	8.00	8.00	8.00	8.00	8.00	8.00	8.00	7.75	7.75	7.75	7.75
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.													
Prime Western	3.25	3.25	3.20	3.20	3.20	3.20	3.25	3.25	3.375	3.40	3.40	3.40	3.35
Brass Special	3.30	3.30	3.25	3.25	3.25	3.25	3.35	3.35	3.475	3.50	3.50	3.50	3.45
Tin (f.o.b. N. Y.) c/lb. Duty Free													
Straits	22.40	22.40	22.45	22.35	22.45	22.30	22.50	23.10	23.40	23.20	22.75	22.875	22.70
Pig 99%	21.75	21.875	21.975	21.85	22.00	21.75	22.00	22.625	22.875	22.75	22.25	22.375	22.20
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60	3.60
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.													
Ingot	35	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.30	6.30	6.30	6.30	6.30	6.30	6.20	6.00	6.00	6.05	6.05	6.05	6.05
Silver c/oz. Troy Duty Free	26.375	26.50	26.375	26.375	26.375	26.625	26.50	26.25	26.375	26.50	26.50	26.625	26.625
Platinum $/oz. Troy Duty Free	25.00	25.00	25.00	25.00	25.00	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50

	18	19	22	23	24	25	26	29	30	High	Low	Aver.
Copper c/lb. Duty Free												
Lake (Del.)	8.125	8.125	8.375	8.375	8.75	8.875	8.875	9.125	9.125	9.125	8.125	8.517
Electrolytic (f.a.s. N. Y.)	8.00	8.00	8.25	8.375	8.625	8.875	8.875	9.00	9.00	9.00	8.00	8.420
Casting (f.o.b. ref.)	7.75	7.75	8.00	8.125	8.375	8.625	8.625	8.75	8.50	8.75	7.75	8.091
Zinc (f.o.b. St. L.) c/lb. Duty 1¼c/lb.												
Prime Western	3.35	3.375	3.45	3.50	3.50	3.60	3.65	3.85	3.90	3.90	3.20	3.405
Brass Special	3.45	3.475	3.55	3.60	3.60	3.70	3.75	3.95	4.00	4.00	3.25	3.491
Tin (f.o.b. N. Y.) c/lb. Duty Free												
Straits	22.75	23.10	24.10	24.00	24.25	25.25	25.50	26.00	25.25	26.00	22.30	23.413
Pig 99%	22.25	22.625	23.625	23.50	23.75	24.75	25.00	25.375	24.75	25.375	21.75	22.905
Lead (f.o.b. St. L.) c/lb. Duty 2½c/lb.	3.60	3.60	3.825	3.975	4.075	4.225	4.225	4.225	4.225	4.225	3.60	3.763
Aluminum c/lb. Duty 4c/lb.	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30	23.30
Nickel c/lb. Duty 3c/lb.												
Ingot	35	35	35	35	35	35	35	35	35	35	35	35
Shot	36	36	36	36	36	36	36	36	36	36	36	36
Electrolytic	35	35	35	35	35	35	35	35	35	35	35	35
Antimony (J. & Ch.) c/lb. Duty 2c/lb.	6.05	6.10	6.25	6.25	6.375	6.50	7.00	7.05	7.00	7.05	6.00	6.308
Silver c/oz. Troy Duty Free	26.625	26.75	28.875	28.25	28.625	28.875	28.875	29.125	29.125	29.125	26.25	27.273
Platinum $/oz. Troy Duty Free	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	37.50	25.00	34.659

Metal Prices, July 6, 1931

(Duties mentioned refer to U. S. tariffs on imports, as given in the Tariff Act of 1930.)

NEW METALS

Copper: Lake, 9.125. Electrolytic, 8.25. Casting, 8.25.
Zinc: Prime Western, 3.95. Brass Special 4.05.
Tin: Straits, 26.00. Pig, 99%, 25.50.
Lead: 4.225. **Aluminum,** 23.30. **Antimony,** 6.95.
Nickel: Ingot, 35. Shot, 36. Elec., 35. **Pellets,** 40.
Quicksilver: flask, 75 lbs., $95. **Bismuth,** $1.50.
Cadmium, 55. **Cobalt,** 97%, $2.50. **Silver,** oz., Troy (N. Y. official price July 8), 28.875.
Gold: oz., Troy, $20.67. **Platinum,** oz., Troy, $37.50.

INGOT METALS AND ALLOYS

		Duty
Brass Ingots, Yellow	7 to 8½	45%
Brass Ingots, Red	8⅞to10¼	45%
Bronze Ingots	10¼to11½	45%
Casting Aluminum Alloys	19 to22	4c lb.
Manganese Bronze Castings	13 to35	45%
Manganese Bronze Ingots	8 to11	45%
Manganese Bronze Forgings	30 to40	45%
Manganese Copper, 30%	18 to30	25%
Monel Metal Shot or Blocks	28	25%
Phosphor Bronze Ingots	9¼to11½	45%
Phosphor Copper, guaranteed 15%	13 to16	3c lb.
Phosphor Copper, guaranteed 10%	12 to15	3c lb.
Phosphor Tin, no guarantee	30 to40	Free
Silicon Copper, 10%	17 to35	45%
Iridium Platinum, 5%	$43.50	Free
Iridium Platinum, 10%	57.00	Free

OLD METALS

	Buying Prices	Duty
Crucible Copper	6¾to 6⅞	Free
Heavy Copper and Wire, mixed	6¼to 6½	Free
Light Copper	5½to 5¾	Free
Heavy Yellow Brass	3½to 3¾	Free
Light Brass	3 to 3¼	Free
No. 1 Composition	5¼to 5¾	Free
Composition Turnings	4¾to 5¼	Free
Heavy Lead	3⅜to 3⅝	2⅛c. lb.
Old Zinc	1½to 1¾	1½c. lb.
New Zinc Clips	2⅛to 2⅜	1½c. lb.
Aluminum Clips (new, soft)	13 to13½	4c. lb.
Scrap Aluminum, cast, mixed	3¼to 3¾	4c. lb.
Scrap Aluminum sheet (old)	9 to10	4c. lb.
No. 1 Pewter	14 to15	Free
Nickel Anodes	22 to23	10%
Nickel Sheet Clips; Rod Ends (new)	24½to25½	10%
Monel Scrap (new)	8 to 9	3c. lb.

Wrought Metals and Alloys

Effective June 29, 1931

COPPER MATERIAL

	Net base per lb.	Duty
Sheet, hot rolled		2½c. lb.
Mill shipment	18⅞c.to19⅞c.	
From stock	19⅞c.to20⅞c.	
Bare wire	10¾c.to11¾c.	25%
Seamless tubing	21⅜c.to22⅜c.	7c. lb.
Soldering coppers:		45%
Lots of 300 lb. or more	17⅜c.	
100 to 300 lb.	17⅞c.	

BRASS MATERIAL—MILL SHIPMENTS

Net base prices per pound

	High Brass	Low Brass	Bronze	Duty
Sheet	16¼c.	17⅝c.	18¼c.	4c. lb.
Wire	16¾c.	18⅛c.	18¾c.	25%
Rod	14½c.	18⅛c.	18¾c.	4c. lb.
Brazed tubing	25⅛c.		28⅞c.	12c. lb.
Open seam tubing	24¼c.		26¼c.	25%
Angles, channels	24¼c.		26¼c.	12c. lb.
Seamless tubing	21⅛c.	22c.	22⅞c.	8c. lb.

NICKEL SILVER (NICKELENE)

Net base prices per lb. (Duty 30% ad valorem.)

Grade "A" Sheet Metal		Wire and Rod	
10% Quality	24c.	10% Quality	27⅛c.
15% Quality	26¼c.	15% Quality	31⅛c.
18% Quality	27½c.	18% Quality	34⅝c.

TOBIN BRONZE AND MUNTZ METAL

Net base prices per pound. (Duty 4c. lb.)

Tobin Bronze Rod	18⅛c.
Muntz or Yellow Metal Sheathing (14"x48")	18¼c.
Muntz or Yellow Metal Plates	18¼c.
Muntz or Yellow Metal Rod	15⅜c.

ALUMINUM SHEET AND COIL

(Duty 7c. per lb.)

Aluminum sheet, 18 ga., base, ton lots, per lb.	32.30
Aluminum coils, 24 ga., base price	30.00

ROLLED NICKEL SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Net Base Prices

Cold Drawn Rods	50c.	Cold Rolled Sheet	60c.
Hot Rolled Rods	45c.	Full Finished Sheet	52c.

MONEL METAL, SHEET AND ROD

(Duty 25% ad valorem, plus 10% if cold worked.)

Hot Rolled Rods	(base) 35	Full Finished Sheets	(base) 42
Cold Drawn Rods	(base) 40	Cold Rolled Sheets	(base) 50

SILVER SHEET

Rolled sterling silver (July 8) 31.50c., Troy oz. upward, according to quantity. (Duty free.)

ZINC AND LEAD SHEET

	Cents per lb. Net Base	Duty
Zinc sheet, carload lots, standard sizes and gauges, at mill, less 7 per cent discount	8.75	2c. lb.
Zinc sheet, open casks (jobbers' price)	10.00to10.25	2c. lb.
Open casks, jobbers' price	10.00to10.25	2c. lb.
Full Lead Sheet (base price)	7.25	2⅜c. lb.
Cut Lead Sheet (base price)	7.50	2⅜c. lb.

BLOCK TIN SHEET

(Duty free.)

Block Tin Sheet—18" wide or less. No. 26 B. & S. Gauge or thicker, 100 lbs. or more, 12c. over N. Y. Pig Tin; 50 to 100 lbs., 18c. over; 25 to 50 lbs., 20c. over; less than 25 lbs., 25c. over.

BRITANNIA METAL SHEET

No. 1 Britannia—18" wide or less, No. 26 B. & S. Gauge or thicker, 500 lbs. or over, 10c. over N. Y. tin price; 100 lbs. to 500 lbs., 12c. over; 50 to 100 lbs., 18c. over; 25 to 50 lbs. 20c. over; less than 25 lbs., 25c. over. Prices F. O. B. mill. (Duty free.)

Supply Prices, July 6, 1931

ANODES

Copper: Cast, Rolled, sheets, trimmed, Rolled, oval — Prices uncertain due to fluctuations in virgin metals
Brass: Cast — Prices uncertain due to fluctuations in virgin metals
Zinc: Cast ..... 10¾c. per lb.

Nickel: 90-92% ..... 44c. to 45c. per lb.
95-97% ..... 44c. to 47c. per lb.
99% ..... 46½c. to 49c. per lb.

Silver: Rolled silver anodes .999 fine were quoted July 8 from 31¾c. per Troy ounce upward, depending upon quantity.

FELT POLISHING WHEELS WHITE SPANISH

Diameter	Thickness	Under 50 lbs.	50 to 100 lbs.	Over 100 lbs.
10-12-14 & 16	1" to 2"	$3.00/lb.	$2.75/lb.	$2.65/lb.
10-12-14 & 16	2 to 3½	3.00	2.70	2.50
6-8 & over 16	1 to 3½	3.10	2.85	2.70-2.75
6 to 24	Under ½	4.25	4.00	3.90
6 to 24	½ to 1	4.00	3.75	3.65
6 to 24	Over 3	3.40	3.15	3.05
4 to 6	¼ to 3	4.85	4.85	4.85
4 to 6	Over 3	5.25	5.25	5.25
Under 4	¼ to 3	5.45	5.45	5.45
Under 4	Over 3	5.85	5.85	5.85

On grey Mexican wheels deduct 10c. per lb. from White Spanish.

COTTON BUFFS

Full Disc Open buffs, per 100 sections.

11" 20 ply 64/68 Unbleached	$16.38 to 20.28
14" 20 ply 64/68 Unbleached	24.32 to 30.12
11" 20 ply 80/92 Unbleached	20.48 to 25.36
14" 20 ply 80/92 Unbleached	30.17 to 37.37
11" 20 ply 84/92 Unbleached	24.60 to 35.59
14" 20 ply 84/92 Unbleached	36.53 to 52.80
11" 20 ply 80/84 Unbleached	26.35 to 32.63
14" 20 ply 80/84 Unbleached	39.06 to 48.38

Sewed Pieced Buffs, per lb., bleached ..... 40c.to 71c.

CHEMICALS

These are manufacturers' quantity prices and based on delivery from New York City.

Acetone	lb.	.09¾-.14
Acid—Boric (Boracic) Crystals	lb.	.07¾
Chromic, 75 to 400 lb. drums	lb.	.15-.20
Hydrochloric (Muriatic) Tech., 20 deg., carboys	lb.	.02
Hydrochloric, C. P., 20 deg., carboys	lb.	.06
Hydrofluoric, 30%, bbls.	lb.	.08
Nitric, 36 deg., carboys	lb.	.06
Nitric, 42 deg., carboys	lb.	.07
Sulphuric, 66 deg., carboys	lb.	.02
Alcohol—Butyl	lb.	.15¾-.21¼
Denatured, drums	gal.	.30-.50
Alum—Lump, barrels	lb.	.03¾-.04
Powdered, barrels	lb.	.03½-.04
Ammonium sulphate, tech., bbls.	lb.	.03½
Sulphocyanide	lb.	.36
Arsenic, white, kegs	lb.	.05
Asphaltum	lb.	.35
Benzol, pure	gal.	.58
Borax Crystals (Sodium Biborate), bbls.	lb.	.04½
Calcium Carbonate (Precipitated Chalk)	lb.	.04
Carbon Bisulphide, Drums	lb.	.06
Chrome Green, bbls.	lb.	.24
Chromic Sulphate	lb.	.30-.40
Copper—Acetate (Verdigris)	lb.	.23
Carbonate, bbls.	lb.	.16½-.17½
Cyanide (100 lb. kgs.)	lb.	.41
Sulphate, bbls.	lb.	.044
Cream of Tartar Crystals (Potassium Bitartrate)	lb.	.27
Crocus	lb.	.15
Dextrin	lb.	.05-.08
Emery Flour	lb.	.06
Flint, powdered	ton	$30.00
Fluor-spar (Calcic fluoride)	ton	$70.00
Gold Chloride	oz.	$12.00
Gum—Sandarac	lb.	.26
Shellac	lb.	.59-.61
Iron Sulphate (Copperas), bbl.	lb.	.01½
Lacquer Solvents	gal.	.85
Lead Acetate (Sugar of Lead)	lb.	.13¼
Yellow Oxide (Litharge)	lb.	.12½
Mercury Bichloride (Corrosive Sublimate)	lb.	$1.58
Nickel—Carbonate, dry bbls.	lb.	.32
Chloride, bbls.	lb.	.18-.19½
Salts, single, 300 lb. bbls.	lb.	.10½-.13
Salts, double, 425 lb. bbls.	lb.	.10½-.13
Paraffin	lb.	.05-.06
Phosphorus—Duty free, according to quantity	lb.	.35-.40
Potash Caustic Electrolytic 88-92% broken, drums	lb.	.08
Potassium Bichromate, casks (crystals)	lb.	.09¼
Carbonate, 96-98%	lb.	.07
Cyanide, 165 lbs. cases, 94-96%	lb.	.50-.60
Pumice, ground, bbls.	lb.	.02½
Quartz, powdered	ton	$30.00
Rosin, bbls.	lb.	.04½
Rouge, nickel, 100 lb. lots	lb.	.25
Silver and Gold	lb.	.65
Sal Ammoniac (Ammonium Chloride) in bbls.	lb.	.04½-.05¼
Silver Chloride, dry, 100 oz. lots	oz.	.24¾
Cyanide (fluctuating)	oz.	.32-.40
Nitrate, 100 ounce lots	oz.	.21½
Soda Ash, 58%, bbls.	lb.	.023
Sodium—Cyanide, 96 to 98%, 100 lbs.	lb.	.16½-.17
Hyposulphite, kegs	lb.	.03½-.04
Nitrate, tech., bbls.	lb.	.03½
Phosphate, tech., bbls.	lb.	.03¾
Silicate (Water Glass), bbls.	lb.	.02
Sodium Stannate	lb.	.23
Sulphocyanide	lb.	.32½-.45
Sulphur (Brimstone), bbls.	lb.	.02
Tin Chloride, 100 lb. kegs	lb.	.27
Tripoli, Powdered	lb.	.03
Wax—Bees, white, ref. bleached	lb.	.60
Yellow, No. 1	lb.	.45
Whiting, Bolted	lb.	.02½-.06
Zinc, Carbonate, bbls.	lb.	.11
Chloride, casks	lb.	.06¼
Cyanide (100 lb. kegs)	lb.	.38
Sulphate, bbls.	lb.	.03½